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IMPERIAL INSTITUTE OF ENTOMOLOGY.

REVIEW
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APPLIED ENTOMOLOGY.

SERIES A.

VOL. 24.] 1936.

VEITCH (R.). **Insect Enemies of Lantana.**—*Qd agric. J.* **44** pt. 2 pp. 142–144. Brisbane, 1st August 1935.

A brief note is given on insects established in Hawaii for the biological control of *Lantana*. In 1917 one of these, *Ophiomyia* (*Agromyza*) *lantanae*, Frogg., was introduced into Queensland [*cf. R.A.E.*, A **8** 158, etc.], where *L. camara* is the dominant species, and it now occurs wherever the weed is found. As, however, it only infests the berries, it cannot affect established plants though it does reduce their spread. The introduction of *Teleonemia lantanae*, Dist., which feeds on the foliage, is under consideration.

SMITH (J. H.). **The Pinhole Borer of North Queensland Cabinet Woods.**—*Qd agric. J.* **43** pts. 5–6 pp. 445–451, 532–548; **44** pts. 1–2 pp. 9–14, 145–153, 30 figs., 5 graphs, 6 refs. Brisbane, May–August 1935; also *Bull. Div. Ent. Dep. Agric. Qd* no. 12, 38 pp., 1 pl., 20 figs., 5 graphs, 6 refs. Brisbane, August 1935.

Crossotarsus grevilleae, Lea, is the most important Platypodid borer of the rain forest timber of northern Queensland. Besides boring into the sapwood, it penetrates the heartwood, which yields the most valuable wood for veneer [*cf. R.A.E.*, A **21** 25]. Its systematic position, the immature stages and the characters distinguishing the sexes are described, and the type of injury is compared with that caused by other borers. A list of the wide range of trees attacked includes all the commercial rain-forest species grown in northern Queensland under conditions suitable for mass infestation. They comprise 20 Angiosperms and at least 2 Gymnosperms, Kauri pine (*Agathis palmerstoni*) and brown pine (*Podocarpus amara*).

The adults are abundantly distributed during the summer and are active during mild weather in the winter. When a tree is felled during the active flight period of the day (10 a.m.–2 p.m.), numerous adults

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alight on it. The male initiates the burrow, but the female extends it through both the sapwood and heartwood. At intervals in the excavation débris is pushed out of the mouth of the burrow. Eggs are laid in any horizontal part of the burrow, but are commonly found in special parts of the burrow system that are more or less isolated from the main thoroughfare. Oviposition may take place over a period of 12 months. In summer the larvae hatch within a month, and help to extend the burrows. They mature in 12 months and pupate in typical Platypodid grouped chambers. The adults re-enter the main channels of the system and ultimately escape by excavating burrows or through fissures leading to the outside. There is probably only one generation a year in the log. Fungi, chiefly of the genera *Monilia* and *Penicillium,* are usually present in the burrows and are possibly the normal food of the borer, while exudates of sap from the wood tissues may serve as an auxiliary food. Attraction to the log appears to be chemotropic, as infestation is heaviest on crushed wood and in areas where the superficial layers of bark have been removed. The burrow system may extend through the whole cross section of the log, but burrow paths lie approximately in the one plane, cutting across the grain of the wood. If the population is high, the burrows may be excavated on the surface of the sapwood and re-enter the wood further along the log. *C. grevilleae* was observed to attack a living tree from which a strip of bark had been removed, and burrows closely corresponding to those of this beetle are often found in the rain forest trees. In the rain forest its numbers are maintained in tree residues and in the wood surfaces exposed at fork fractures. The resistance of the bark of commercial logs to infestation is due to physical properties, particularly of the superficial layers.

Predators include the Formicids, *Rhytidoponera* (*Chalcoponera*) *impressa,* Mayr, *Meranoplus puryi,* For., and *Pheidole* sp., and the Clerid, *Omadius yorkensis,* Kuw., which attack the free-living adults, and mites, which attack the immature stages in the burrows. These have very little effect on the population.

Severe mass infestation of the log surface does not take place at temperatures below 82°F., which tend to inhibit flight. Temperature records for February and March 1933, taken in open country near the rain forest and in the rain forest under canopy, are shown in graphs. The maximum daily temperatures for 1932 in 3 logging areas that differ climatically are considered with respect to their exceeding 82°F. and shown to be directly correlated with the infestation that occurred in these places. Logs stored under complete canopy where the temperature seldom rises above 80°F. are rarely attacked, but the surface of the sapwood dries slowly and maintains its chemotropic attractiveness longer, so that logs should not be removed from canopy until a fortnight after felling. Logs stored more than 110 yds. from the rain forest escape infestation.

Modifications in logging practices to minimise losses are discussed. Logging is best done in winter when there are fewer insects and haulage conditions are good. The logs should be barked to allow the superficial layers to dry out. If logging has to be done in the summer when infestation is highest, the bark should be left on. Felling and haulage should be co-ordinated to ensure rapid transport to open country ramps. If indispensable, ramps in the rain forest should be canopied. As the practice of exposing a ring of sapwood before measuring the log invites infestation, this should be done outside the rain forest.

MUGGERIDGE (J.). **Entomology Section.**—*Rep. Dep. Agric. N.Z. 1934–35* p. 47. Wellington [N.Z.] 1935.

During 1934–35 insect pests were more abundant than usual in New Zealand, following the warm dry weather of the previous season. *Plutella maculipennis*, Curt., caused serious injury to cruciferous crops. The biological control of *Pieris rapae*, L., by the imported larval parasite, *Apanteles glomeratus*, L., was hindered by a hyperparasite, *Eupteromalus* sp. About 877,000 adults of the pupal parasite, *Pteromalus puparum*, L., were reared during the year and liberated throughout North Island and parts of South Island [*cf. R.A.E.*, A **23** 724, etc.]. Up to 90 per cent. of the pupae of *Pieris rapae* collected were parasitised. In the Hawke's Bay area, where the first liberations of *Pteromalus* had been made and where *Pieris* had been very abundant, the latter was reduced to insignificant numbers.

Encarsia formosa, Gah., which was liberated in greenhouses for the control of *Trialeurodes vaporariorum*, Westw., in the previous year [**22** 724], successfully overwintered in the Hawke's Bay area, and the whitefly was far less prevalent there. During the summer the parasite spread further northwards and was found in greenhouses and in the field.

SEIN, jr. (F.). **Heat Sterilization of Mangoes and Guavas for Fruit Flies.**—*J. Agric. Univ. P.R.* **19** no. 2 pp. 105–115, 3 refs. Rio Piedras, P.R., August 1935.

The importation of mangos or guavas into the United States from Porto Rico is prohibited in view of their liability to infestation by *Anastrepha* spp. At Rio Piedras, experiments on the sterilisation of 2,000 mangos and 500 guavas at 43°C. [110°F.] in a circulating atmosphere [*cf. R.A.E.*, A **19** 449] showed that in 8 hours all the eggs and larvae were killed. Pupae placed among the fruits were also killed. In subsequent tests heating the fruit for 4 hours only was found to be effective, and for 8 hours if it was wrapped and crated. Neither the flavour nor the keeping qualities were impaired if the fruit was afterwards kept in refrigeration. As infested mangos have no commercial value, only immune varieties would be worth exporting to the United States, but these should be acceptable after heat treatment. There is no market for fresh guavas.

CARDOSO (J. G. A.). **Dos inimigos do gafanhoto vermelho.** [The Enemies of *Nomadacris septemfasciata*.]—*Moçambique Docum. trim.* no. 3 pp. 65–96, 11 pls., 2 figs. Lorenzo Marques, September 1935.

This popular account of the natural enemies of *Nomadacris septemfasciata*, Serv., in Mozambique contains good photographic and coloured plates showing locusts killed by *Empusa grylli*, *Sporotrichum* sp. and *Coccobacillus acridiorum*. Of the other natural enemies observed, brief descriptions of which are given, mites of the genera *Tyroglyphus* and *Rhizoglyphus*, *Stomatorrhina lunata*, F., *Scelio* sp., and *Epicauta* sp. are parasites of the eggs. A mite, *Erythraeus* sp., and *Mermis* sp. infest the adults and hoppers, and *Sarcophaga* sp. the adults. The Tenebrionid, *Psammodes carbonarius*, Grst., destroys many eggs and even hoppers, and a Tettigoniid, *Acanthoplus armativentris*, sp. n., also attacks the locusts.

Mallamaire (A.). **La désinfection des semences de caféiers par la chloropicrine.**—*Agron. colon.* no. 213 pp. 70–79, 8 refs. Paris, September 1935.

In the Ivory Coast, *Stephanoderes hampei*, Ferr., normally attacks 5–20 per cent. and sometimes up to 50–80 per cent. of the coffee crop. Though it has only been recorded there comparatively recently [*R.A.E.*, A **13** 392] and newly cultivated forest lands are free from infestation, there is some evidence that it is a native insect. Varieties of coffee with a thin pericarp are most severely infested. Fumigation with turpentine [*cf.* **19** 193 ; **21** 424] is at present the only method of seed sterilisation used on the Ivory Coast, but in 1933 experiments were made with chloropicrin, details of which are given. It was found that exposure to concentrations equivalent to ½ oz., 1 oz., 1½ oz., and 5 oz. per 100 cu. ft. for 8, 4, 2, and 1 hours respectively killed all stages of the beetle in infested coffee berries. Batches of freshly picked berries of two varieties were then fumigated as before but for 25 per cent. longer time in each case, and the seeds were dried and planted out with alternate batches of untreated ones from the same picking. The treated seeds germinated 2–6 days later than the untreated seeds, and the percentages germinating were 72–79 and 74–81, respectively. Seeds treated with 2, 3, 6½, and 12½ oz. chloropicrin per 100 cu. ft. for 12, 6, 2, and 1 hours respectively and sown in a similar manner only gave 1–4 per cent. germination. It is therefore undesirable to lengthen the treatment or increase the concentration.

Hancock (G. L. R.). **The Major Pests of the Cotton Plant in Uganda.**—*Uganda J.* **3** no. 1 pp. 26–46, 5 pls. Kampala, 1935.

This paper contains notes on the chief pests of cotton in Uganda [*cf. R.A.E.*, A **22** 197] and particularly the types of injury they cause, and also a brief general discussion of the factors that influence the incidence of cotton pests on the crop, including isolation, climate, condition of the plant, period during which food-supply is available, alternative food-plants and natural enemies.

Tsou (T. L.). **The Distribution of the Migratory Locust and Ecological Study of its breeding Ground in China.** [*In Chinese.*]—*Agric. sinica* **1** no. 8 pp. 239–272, 5 pls., 11 diagr. Nanking, July 1935. (With a Summary in English). [Recd. October 1935.]

In China, the area in which invasions of *Locusta migratoria*, L., occur lies between the latitudes of the Gulf of Chili (39°N.) and Hangchow Bay (30°30′N.). It is delimited by low winter temperatures (—6·1°C. [21·02°F.] in January) in the north, by mountains on the west, and by mountains and excessive precipitation (reaching 59 ins. a year) in the south, where the invasions are checked directly by the rainfall and indirectly by parasitic fungi. In the normal area, which lies within the invasion area and the limits of which are shown on the map, the annual precipitation is 15¾–18 ins., falling mainly in summer. Here the breeding places of the swarms are concentrated along the sea coast and lake shores and in alkali lands, the vegetation of which is described, as well as in swamps and uncultivated lands, all of which are most common in the valley of the lower Yellow River and to the north of the Yangtse [*cf. R.A.E.*, A **23** 638]. The outbreaks usually take place when a dry summer and autumn are followed by a warm winter ; the last two occurred in 1929 and 1933. The winter is passed in the egg stage, and there are two generations a year [*cf.* **23** 46], the first hatching early in May and occurring till August, the second hatching in July and occurring till October–November.

SUBRAMANIAM (T. V.). **Report of Work done in the Entomological Section for the Year 1933-34.**—*Rep. Mysore agric. Dep. 1933-34* pp. 23–27. Bangalore, 1935.

Epilachna [*vigintioctopunctata*, F.] was less injurious on potatoes and *Diacrisia obliqua*, Wlk., on vegetables and fruit trees in Mysore than in the previous year [*cf. R.A.E.*, A **22** 594]. Sulphur dust and sodium lineoleate were effective against *Idiocerus* spp. on mango, but the former slightly scorched the blossoms. Studies on sugar-cane borers, which in one locality caused an average loss of 8·7 tons per acre, showed that *Argyria sticticraspis*, Hmps., and *Scirpophaga* spp. caused the most damage. Canes planted from February to April were more severely attacked than those planted at any other time. The germination of setts that had been immersed in cold water for 2 days [*cf.* **23** 87] was 12 per cent. more than that of untreated ones. In one locality where weekly liberations of *Trichogramma minutum*, Riley, were made, the percentage of parasitised borer eggs increased from 2 to over 50 in 3 weeks. On experimental plots in another locality an increase in the yield of sugar was obtained by collecting the egg-masses and adults of *Scirpophaga* by hand, and also by trapping the adults in bundles of trash. Following one application of tar distillate (10 per cent.) against *Xylotrechus quadripes*, Chevr., on coffee [*cf.* **22** 594], infestation was half that in an untreated area. *Xyleborus morstatti*, Hag., was found breeding in large numbers on small branches and twigs of *Coffea robusta*. *Pagiophloeus umbricidus*, Mshl., caused serious damage to young *Grevillea* grown as shade for tea in one locality. *Phthorimaea heliopa*, Lw., severely attacked tobacco in nursery beds. The infestation was traced to plants left in the field after harvest. Covering the beds with cheese cloth during the night prevents the moths from ovipositing on the plants. Spraying twice a week with hongay [*Pongamia glabra*] oil resin soap (1 lb. in 10 gals. water) destroys the larvae. A water extract of the roots of *Randia dumetorum*, used at 10 per cent. strength in the laboratory, killed 80 per cent. of *Coccus viridis*, Green, on coffee in 4 days but was not very effective against grasshoppers. In one locality *Pachydiplosis oryzae*, Wood-Mason, seriously damaged 50 per cent. of the rice crop during September and October. This was the first severe outbreak for 30 years.

MILES (H. W.). **On the Biology of certain Species of** *Amauronematus* **Kon. (Hymenoptera Symphyta).**—*J. Linn. Soc.* (Zool.). **39** no. 266 pp. 295–306, 2 pls., 3 figs., 7 refs. London, 25th September 1935.

An account, based on laboratory and field observations in Lancashire and Cheshire, is given of the bionomics of *Amauronematus miltonotus*, Zadd., *A. vittatus*, Lep., and *A. perkinsi*, Benson, the larvae of which infest cultivated willows. The immature stages of each species are briefly described and compared. Data on larval development refers to males only as all eggs laid in the laboratory were produced parthenogenetically. Probably the female larvae have an extra instar. Feeding takes place along the edges of the leaves. The larvae of *A. vittatus* and *A. perkinsi* differ from those of *A. miltonotus* in moulting immediately before entering the prepupal stage. Each species inserts its eggs into the leaves on the underside, has one generation a year and overwinters in a cocoon in the prepupal stage. *A. miltonotus* and *A. vittatus* make their cocoons in the soil.

In 1931–34 adults of *A. miltonotus* were on the wing in early June and probably May. The larvae, which had 4 instars, can be found throughout June but are only rarely taken after the beginning of July. In the laboratory adults emerged from late March to early April. When the amount of available leaf-tissue is limited, numbers of eggs are laid in each leaf. In the field the eggs are widely distributed over the plants, as the larvae feed singly. They hatched in 12–14 days at 56–61°F. The larvae completed their feeding in about 23 days. Adults of *A. vittatus* and *A. perkinsi* were not taken in nature. Nearly mature larvae of the former were found until after mid-June on *Salix repens*. In the laboratory eggs were laid in the leaves of *S. viminalis*. They hatched in 12 days, but only 25 per cent. of the larvae, which were fed on *S. viminalis*, survived the first instar. The larvae had 5 instars and were full-fed in about 26 days. Larvae of *A. perkinsi* were found on the leaves of *S. caprea* during June and early July. In the laboratory the eggs hatched in 10 days in April, but none of the larvae survived the first instar. Larvae collected in the field tunnelled into the corks of the tubes in which they were confined and into pieces of peat, and overwintered in cocoons in the tunnels. Probably in the field the tunnels are made in dead wood or bark.

NICHOLSON (A. J.) & BAILEY (V. A.). **The Balance of Animal Populations.—Part I.**—*Proc. Zool. Soc. Lond.* 1935 pt. 3 pp. 551–598, 15 figs. London, September 1935.

This paper deals with the mathematical investigation of the problems of the balance of animal populations from theoretical principles [*cf. R.A.E.*, A **21** 369], for the details of which it should be consulted in the original.

The following is substantially the authors' summary : The problem of competition between animals when searching for the things they require for existence is examined. It is shown that, even when individual animals search systematically, the searching of populations is always random, and that the competition resulting from random searching can be expressed by a simple formula or curve of general application. The interaction in the steady state of a specific entomophagous parasite and its specific host is examined. The steady state of interacting entomophagous parasites and hosts, having discontinuous interaction, is examined in the following situations :—Several specific parasites attack a common host ; specific parasites are themselves attacked ; a parasite attacks two or more specific hosts. The effects produced by the modification of the area of discovery of a parasite, by the introduction of an additional specific parasite, and by the modification of the power of increase of a common host, are also investigated. It is shown that the steady state may exist in all the situations just mentioned, provided that the animals have properties that lie between certain limits, and that Volterra's conclusion, that only an even number of interacting species can be in a steady state, is incorrect. The problem of the interaction of entomophagous parasites and their hosts when not in the steady state is examined for certain relatively simple types of interaction. It is concluded that the interaction of animals may by itself cause the densities of the animals to oscillate about their steady values. According to the circumstances, the magnitude of the oscillations may decrease, remain constant, or increase with time. In the latter situation, the oscillation may ultimately split the species-population into numerous small groups of individuals, which fluctuate in density independently of one another. The problem involving continuous interaction between entomophagous parasites and their hosts is discussed. It is concluded that it is essential to consider the effects of age-distribution. When this is done, it is found, as in the previous problem, that the interaction of two species leads to oscillations of the animal densities about their steady values, and that the magnitude of these oscillations increases with time. The discussions by Lotka and Volterra of the problem involving continuous interaction are criticised, and are shown to lead to results inconsistent with some of the conclusions of the more rigorous theory, due to Bailey, in which the effects of age-distribution are explicitly considered. The detailed conclusions are expressed algebraically and illustrated graphically.

HEY (G. L.). **Notes on Tortricidae. 1.** *Batodes angustiorana* **Haw.**—*Ent. mon. Mag.* **71** no. 858 pp. 253–255, numerous refs. London, November 1935.

The distribution and food-plants of *Batodes angustiorana*, Haw., are reviewed from the literature, and the first three larval instars are described. This Tortricid is a polyphagous foliage feeder, and in England is sometimes a serious pest in orchards and vineries, as it also attacks the fruit of apple, pear, plum, damson and vine. In orchards it usually occurs with other Tortricids [*cf. R.A.E.*, A **22** 585], and *Tortrix* (*Cacoecia*) *podana*, Scop., and *Eucosma* (*Spilonota*) *ocellana*, Schiff., generally outnumber it. Its life-history appears to be identical with that of *T. podana* [**23** 125]. Although the moths are usually recorded in July and August, the author found them in Kent more commonly in June than July and never in August. Parasites of the larvae bred by the author were *Apanteles* sp., *A. longicauda*, Wesm., *Macrocentrus abdominalis*, F., and *Actia pilipennis*, Fall. The rate of parasitism was very low.

MELLOR (J. E. M.) & WOODMAN (R. M.). **A Note on Preliminary Work on Attractants for Cabbage Root Fly** (*Hylemyia* (*Chortophila*) *brassicae* **Bché.**) **and Carrot Fly** (*Psila rosae* **L.**).—*Ent. mon. Mag.* **71** no. 858 pp. 258–259. London, November 1935.

In the summers of 1932–34, experiments were carried out in England to find an attractant that could be mixed in a poison bait to kill females of *Phorbia* (*Hylemyia*) *brassicae*, Bch. (cabbage root fly) and *Psila rosae*, F. (carrot fly) before they oviposit. The 23 substances tested were placed in small tins under wire balloon fly-traps in infested fields. Not many insects were taken, and none of these was *Psila rosae*. Yeast, allyl mustard oil and glycine in that order proved the most attractive to *Phorbia brassicae* and *P.* (*H.*) *cilicrura*, Rond., which were caught in most of the traps. Hexachloroethane was the only bait that attracted *Anthomyia pluvialis*, L. More females than males were taken and many were gravid. Some beetles, chiefly *Calathus ambiguus*, Payk., were also taken, most of them in the traps baited with aniseed oil, glycerol or coumarin.

Robertson (W. A.). **Report of the Forest Products Research Board for the Year 1934.**—Med. 8vo., 75 pp., 2 pls., 4 figs. London, H.M.S.O, 1935. Price 1*s*. 6*d*. net.

Research on entomological problems is described on pp. 31–37. In the course of investigations on the food of larvae of *Lyctus* spp. [*cf*. *R.A.E.*, A **20** 454], a substance resembling starch in its chemical reactions was isolated from oak sapwood in 1933. Subsequent work has shown that extraction of samples of the sapwood with water at 60°C. [140°F.] removes a substance that is necessary for normal larval development. When it was absent, many larvae died soon after hatching, and those that survived had grown very little after tunnelling for a year in the wood, in spite of the presence of abundant starch. Extraction at 100°C. [212°F.] removed the starch also and rendered the wood totally unsuitable for larval development. Preliminary results of further experiments on the steam sterilisation of timber [*cf*. **21** 137] indicated that at 125°F. exposures of 4 and 2 hours at relative humidities of 60 and 80 per cent. respectively were sufficient to kill all larvae of *Lyctus* spp. in timber 1 in. thick. At 105°F. the corresponding times of exposure were 168 and 144 hours. In tests to determine the rate of disappearance of starch in timber kept in the log, the sapwood decayed in logs kept in the open, but the starch disappeared in a year from the sapwood of a piece of oak (4 ft. long and 20 ins. in diameter) kept under shelter. Experiments at 30–35 per cent. humidity have shown that 5 minutes at 122°F. and 131°F. kills larvae of *Anobium punctatum*, DeG., that have been removed from wood but the eggs require 20 minutes at 131°F. and 5 at 140°F.

Britton (W. E.). **The Gypsy Moth.**—*Bull. Conn. agric. Exp. Sta.* no. 375 revd pp. 623–647, 18 figs., 1 ref. New Haven, Conn., August 1935.

This bulletin, which is a revision of a previous one, comprises general information on *Porthetria dispar*, L., in the United States, including notes on its distribution and bionomics, the type of damage it causes, its indigenous and imported natural enemies and measures for preventing its spread and controlling it.

Glaser (R. W.) & Farrell (C. C.). **Field Experiments with the Japanese Beetle and its Nematode Parasite. With a statistical Analysis by J. W. Gowen.**—*J. N.Y. ent. Soc.* **43** no. 3 pp. 345–371, 4 refs. New York, N.Y., September 1935.

Investigations were continued in New Jersey on the control of larvae of *Popillia japonica*, Newm., by the Nematode parasite, *Neoaplectana glaseri*, Steiner [*cf. R.A.E.*, A **20** 471]. The parasite had been introduced into small field plots in 1931 by sprinkling them with water containing cultures of the second stage. In the spring of each subsequent year more than 200 beetle larvae were added to each plot and its control. In 1933–34, no adult beetles emerged from the experimental plots, but 180–143 emerged annually from each of the controls. Many parasitised larvae were found, and of 39 adults that emerged from the experimental plots, 10 harboured the parasite in their intestines. In this way natural dispersion of the Nematodes may occur.

In 1931 sprinkling or spraying large fields with water containing cultures of second stage Nematodes proved an unsuccessful method of introduction, and only rarely were parasitised larvae discovered. A marked population fluctuation occurred in all the plots between 1931 and 1934, apparently the result of other factors.

In May 1933 cultures of the parasites were buried in holes in the ground, 3–4 ins. deep. Between April 1933 and October 1934 the number of larvae per sq. ft. was reduced in plot A from 95·3 to 3·2 and in plot C from 87·5 to 3·6. The holes were spaced every 5 ft. in A and every 18–20 ft. in C. The parasites spread naturally into plot B, which was 20 ft. wide and separated from A and C on each side by 5 ft., and by October 1934 the number of grubs per sq. ft. was reduced by about 50 per cent. In plot C in October 1934 the number of larvae per sq. ft. was 2·2 at the position of the holes and 4·8 between them. A test comparison of the parasitised area and the surrounding untreated field showed that the number of grubs had been reduced within the former.

Birds, moles, climatic and other factors affect the population of grubs, and it is impossible to maintain a constant, heavy population over a period of years within a given territory.

FREAR (D. E. H.) & WORTHLEY (H. N.). **Removal of Spray Residues from Apples.**—*Bull. Pa agric. Exp. Sta.* no. 318, 13 pp., 2 figs. State College, Pa, June 1935. [Recd. October 1935.]

Much of the information in this Bulletin on washing experiments undertaken in Pennsylvania in 1934 to remove arsenic and lead from apples sprayed with lead arsenate has already been noticed [*R.A.E.*, A **23** 696].

The following is taken from the authors' summary : Hydrochloric acid at a concentration of 1–2 per cent. by weight (3–6 gals. 20° Bé. acid per 100 gals. water) removed the greatest amount of residue without injuring the fruit. An exposure of 1 minute to the acid should be satisfactory in most cases. If cold 2 per cent. acid does not clean the apples efficiently, the temperature should be maintained at 100°F., and if this is still unsatisfactory, the time of exposure should be lengthened to 1½–2 minutes. The addition of wetting agents or salt did not increase the efficiency of the acid solution. The solutions should be tested frequently and kept up to the required strength, and in a washer of standard size fresh solution should be used after every 1,000 bushels of apples washed. Sufficient water (2–3 U.S. gals. per bushel) should be used to remove the acid from the washed fruit. The keeping quality of the fruit is not impaired by packing the apples wet, but the use of a dryer facilitates grading and packing. A home-made flotation washer is described by A. W. Clyde.

VANCE (A. M.). **Report on Status of the European Corn Borer in 1934.**—9 pp. mimeographed, 1 diagr., 2 maps. [Washington, D.C.] U.S. Dep. Agric., Bur. Ent., December 1934. [Recd. October 1935.]

This paper gives a detailed account of the distribution of the European corn borer [*Pyrausta nubilalis*, Hb.] in the United States during 1934 and compares similar data for 1925–33 [*cf. R.A.E.*, A **23** 541 ; etc.]. In comparison with 1932 and (where surveys had been made) with 1933 there was a general decrease in infestation over the one generation area as a whole ; an increase occurred, however, in certain parts of New York, Ohio and Indiana. The general decrease in infestation, was probably due to dry hot weather in May, June and July. In the two generation area also there was a general decrease of infestation, though less marked ; 16·1 and 28·8 per cent. of the maize fields in the two and one generation areas, respectively, were uninfested and 21·2 and less than 0·5 per cent. of the infested fields contained more than 200 borers to 100 plants. In part of the two generation area, where the climate was normal, infestation increased, particularly in certain counties in Massachusetts and in New Jersey.

Hamilton (C. C.). **The Control of Insect Pests of Lawns and Golf Courses.**—*Circ. N.J. agric. Exp. Sta.* no. 347, 16 pp., 4 figs., 3 refs. New Brunswick, N.J., March 1935. [Received October 1935.]

This paper contains an account of the insect pests of turf in New Jersey, describing the type of injury they cause and measures for their control. The habits of Lamellicorn larvae and their control by lead arsenate are dealt with in some detail [*R.A.E.*, A **21** 456]. The other pests include the webworms of the genus *Crambus* [**21** 457 ; **22** 100], *Blissus leucopterus*, Say [**17** 517 ; **21** 659] and grasshoppers, cutworms and ants, against which poison baits are recommended.

Schoene (W. J.) & Underhill (G. W.). **Life History and Migration of the Apple Woolly Aphis.**—*Tech. Bull. Va agric. Exp. Sta.* no. 57, 31 pp., 15 figs., 20 refs. Blacksburg, Va, May 1935. [Recd. October 1935.]

Research on the bionomics of *Eriosoma lanigerum*, Hsm., in various parts of the world is reviewed, and a detailed account is given of the results of studies in Virginia of its life-cycle on the primary food-plant, *Ulmus americana*, and on apple, on which viviparous forms may be found throughout the year. In Virginia, the winter eggs are placed singly in crevices of the bark of *U. americana* during September, October and November, and usually hatch in March, or in some cases late in February, several weeks before the elm buds open. The stem-mother crawls to a terminal twig and usually settles on the leaf scar at the base of the terminal bud, where it feeds and rests until the bud opens. This feeding on the base of the bud stimulates the terminal growth and with the subsequent feeding of the insect and its progeny on the leaves produces the abnormal curled condition known as the rosette. Only one stem-mother is usually found in each rosette but in some instances two or even three occur. The stem-mother begins to produce young early in April when the buds begin to open. The rosettes are usually fully mature and begin to fade in May. Rosettes have been observed on trees of all ages from 4 years upwards. The two most important factors governing their abundance, which varies from year to year, are the weather during the previous summer and autumn and the proximity of apple trees. The degree of infestation of newly planted apple trees is similarly influenced by the proximity of infested elms. Observations made by caging rosettes, and field studies of rosettes and apple foliage, showed that emergence of winged forms migrating from the rosettes continues from the end of April to mid-June, maximum emergence occurring between 10th and 20th May. Elms were free from infestation from June to September. The yearly average number of migrants produced per caged rosette, from which natural enemies were partly excluded, ranged from 509 to 1,161 for 1925–29. They usually left the rosettes on the second or third day after the wings developed and produced young in 48–96 hours. Their flight is chiefly influenced by temperature and air currents, cool and windy weather retarding their activity. They tend to fly near the ground and are able to select apple growing among other plants. The autumn migrants from apple show a similar ability to select *U. americana*. Their progeny are wingless sexual forms that do not feed and live about 3 weeks. Only one egg is laid by each female.

During a study covering 14 seasons, no eggs were observed in aerial colonies of *E. lanigerum* on apple, on which both apterous and alate viviparous females occur, the latter developing mainly in the autumn. The apterous forms on apple matured in 14–16 days when the daily mean temperature averaged 70°F. and in about 11 days when it was about 80°F. Young were born at the rate of about 5 a day over a recorded period averaging 17 days. The life of the Aphids averaged about 30 days. Natural spread by crawling of newly-born young was found to be an important factor in dissemination from tree to tree in the nursery. Their movements on nursery trees was determined by means of adhesive bands, etc., and on the ground by placing apple twigs at different distances on all sides of infested nursery trees. Though slightly active at 60–65°F., they were not definitely so until the temperature rose, when they sought shade. The direction and extent of their movement was influenced by wind.

The progeny from spring migrants infest the crown and roots of nursery stock early in the first season after they are planted. The percentage of trees infested on the roots in the first season in a place where elms are abundant, averaged 30 for 10 seasons. At the end of the second season 40 per cent. were infested, and the degree of root knotting was much greater than in the first year. On an average the percentage did not increase much during the third year. The abundance and time of appearance of autumn migrants is affected by seasonal conditions, few appearing in dry, hot weather. They are liable to be numerous whenever there is a cool, damp period between August and December. Summer alatae, which have been reported on apple in several European countries, were found in very small numbers in aerial colonies of *E. lanigerum* in Virginia in six years out of nine. They gave birth to progeny of two types, one resembling the sexuales commonly produced by autumn migrants and the other similar to the parthenogenetic type [*cf. R.A.E.*, A **14** 221]. The latter fed on apple roots and twigs in cages but could not be kept long enough in the laboratory to determine whether they reproduce ; females of the former type kept in Petri dishes laid one egg each typical of those normal for sexuales.

MUNRO (J. A.) & FOX (A. C.). **Carpenter Worm, Biology and Control.**—*Bull. N. Dak. agric. Exp. Sta.* no. 278, 23 pp., 8 figs., 48 refs. Fargo, N. Dak., October 1934. [Recd. October 1935.]

The Cossid, *Prionoxystus robiniae*, Peck, which is widely distributed in the United States and south-eastern Canada, has caused serious injury in recent years to green ash (*Fraxinus lanceolata*) in North

Dakota [*cf. R.A.E.*, A **19** 544], where it has also been found in elm, oak, maple and poplar. A list from the literature is given of the trees attacked in other States, and the method of boring and both macroscopic and microscopic injury to the trees are described. The life-cycle requires 4 years in North Dakota. The eggs, which are laid singly or in masses in cracks in the bark, hatched in 11–14 days. The young larvae usually moved about on the bark for a few hours before mining into it, and sometimes left the tree or were blown from it by wind; in this way they might infest neighbouring trees. Larvae survived a midwinter temperature of −31°F. Pupation normally occurred in the middle of May, and the pupal stage lasted about 18 days. The moths were seldom observed after the end of June. The males were attracted by the scent glands of the females as soon as the latter emerged, and mating and oviposition took place the same night. The female does not fly far, so that the infestation spreads chiefly by the transport of infested wood and trees. Seedlings are not known to harbour the insect. Kingbirds (*Tyrannus* spp.) were observed feeding on the pupae and emerging moths, and woodpeckers were estimated to destroy 75 per cent. of the young larvae. An Ichneumonid, *Amersibia prionoxysti*, Rohw., has been reared from the larvae in Virginia.

The larvae may be killed in their burrows by injecting a fumigant and sealing the holes with wax. Of fumigants tested, carbon bisulphide and "Dowfume" (a mixture of carbon tetrachloride and propylene dichloride) were effective. The latter is cheaper and is not inflammable.

BRYSON (H. R.). **Observations on the Seasonal Activities of Wireworms (Elateridae).**—*J. Kans. ent. Soc.* **8** no. 4 pp. 131–140, 8 refs. McPherson, Kans., October 1935.

From observations made over 8 years at Manhattan, Kansas, on three or four species of *Melanotus* and one of *Aeolus*, it is concluded that wireworms move vertically in the soil in response to conditions on the surface. Although they are able to withstand very low temperatures, being found alive in frozen masses of soil, those above 80°F. and below 32°F. are unfavourable.

During 4 different years, wireworms were collected at depths of from 1 to 26 ins., the average depth per year varying from 6 to 10·7 ins. Between late June and mid-July a downward movement took place, either to escape the high temperature or, particularly in the case of the genus *Melanotus*, to pupate. The larvae returned towards the surface in mid-September but descended to below the 6-inch plough line in late autumn to escape the cold of the winter months. Since immature larvae were found deep down, pupation was not a cause of this movement. In early spring they again returned to near the surface and were collected in March chiefly from old grass roots and under stones, in April from under stones and from cow-dung where they fed on the larvae of a dung-beetle, *Aphodius fimetarius*, L., and in May and June from germinating seeds, early planted maize and the roots of various cultivated plants. On their native grasslands never more than 1 or 2 wireworms are found to the square foot. Control by autumn ploughing is therefore of doubtful value [*cf. R.A.E.*, A **16** 79], as if the larvae are within 6 ins. of the surface, the soil is not cold enough to render them inactive and they immediately burrow downwards when turned up by the plough.

Isely (D.). **Variations in the Seasonal History of the Colorado Potato Beetle.**—*J. Kans. ent. Soc.* **8** no. 4 pp. 142–145, 4 refs. McPherson, Kans., October 1935.

In Arkansas the Colorado potato beetle [*Leptinotarsa decemlineata*, Say] normally has one generation a year ; the overwintered adults oviposit from April to June, and those of the first brood mature from May till early July and, after a few days feeding, go into diapause in the soil in spite of good conditions of food and weather and a season ahead long enough to produce several generations. The feeding of the overwintered adults and larvae takes place when the foliage of the potato and *Solanum carolinense*, the most important wild food-plant, are growing rapidly. Variations in this cycle occur, however, and in 1934 an outbreak on late potatoes was observed in September. Under favourable conditions the beetle has completed its life-cycle in 31 days, including a preoviposition period of 7 days. In 1930, although 93·91 per cent. of the first generation reared between 29th May and 20th July went into diapause normally within 10–15 days of maturity without laying eggs, 3 more generations were reared from the remaining 6·09 per cent. The average preoviposition periods were 8·11 and 7·38 days for the second and third generations, respectively. The adults of the fourth generation, which were reared between 27th October and 11th November, produced no eggs, and nearly all went into hibernation after feeding for a short time. The first 3 generations were reared on rapidly growing foliage from plants treated with sodium nitrate. Although the evidence is not conclusive this suggests a relationship between the number of generations and the availability of rapidly growing foliage for food just after maturing. During the succeeding years most of the beetles reared were single brooded, but in 1931 a partial second generation was obtained, and in 1932 and 1933 there were individuals of a second and third generation. They could not be definitely connected with special food. A divergence from the usual longevity also developed. Some beetles reared each year reproduced during each of the 2 years following maturity, and hibernated during 2 winters ; others extended the diapause for 2 years, maturing in 1932 and laying in 1934. Intermittent periods of reproduction and diapause also occurred in the same year.

Thorne (G.). **Nemic Parasites and Associates of the Mountain Pine Beetle** (*Dendroctonus monticolae*) **in Utah.**—*J. agric. Res.* **51** no. 2 pp. 131–144, 10 figs., 4 refs. Washington, D.C., 1935.

A brief review is given of the history of the occurrence of *Dendroctonus monticolae*, Hopk., on lodgepole pine (*Pinus contorta*) in Utah, where there is evidence of its presence since about 1785, though conditions appear to be relatively unfavourable to outbreaks. An outbreak involving many thousands of trees began in 1929, however, in widely separated localities and spread rapidly from 1930 to 1932 before it was checked by burning the infested trees. During a survey made at this time, a new endoparasitic Nematode, *Aphelenchulus reversus*, and 8 new Nematode ectoparasites and associates of the beetle were found. All are described, and for one the new genus *Panagrodontus* is erected. About 2 per cent. of the larvae and adults of *Dendroctonus* were each infested with 1–11 females of *A. reversus*. These deposited several hundred eggs in the body cavity of the host, in which first and second stage larvae were also found. Subsequent stages were not observed, but presumably include those in which transfer from host to host occurs. The other 8 new Nematodes were either found as larvae under the elytra of the beetles or as adults in the frass, in the tunnels made by the beetles, or in some instances in the bodies of dead adults, but never in living ones. *Rhabditis obtusa*, Fuchs, was found in a single tree in which " sour sap " had followed beetle infestation. During the 1929–32 outbreak, parasitism by Nematodes was negligible. As none of the Nematodes associated with *D. monticolae* was present in samples of bark from uninfested trees or in the soil at the base of these trees, it is probable that they are carried from tree to tree by the beetles.

WHITE (G. F.). **Potato Beetle Septicemia.**—*J. agric. Res.* **51** no. 3 pp. 223–234, 11 figs., 4 refs. Washington, D.C., 1935.

An account is given of studies on *Bacillus leptinotarsae*, which causes septicaemia in larvae of *Leptinotarsa decemlineata*, Say [*R.A.E.*, A **16** 552], based on material obtained from a potato plot in Washington, D.C., in 1921–23. A similar disease was observed in larvae of *Leptinotarsa* in Virginia in 1921. The bacillus and the symptoms it causes are described ; it is similar to *B. sphingidis* and *B. noctuarum* [**12** 215]. It was easily destroyed by drying but lived long (8 years on artificial media) in a moist environment. When inoculated by puncturing, it killed 85 out of 88 larvae of *Leptinotarsa* in 2 days ; the adults were more resistant, but in 11 days 15 out of 19 died. Of 244 silkworms (*Bombyx mori*, L.) 243 died after 1 day ; larvae of other Lepidoptera and Lamellicorns all died in 2 or 3 days. Since inoculation by feeding and immersion methods gave negative results, it is possible that the bacillus, reaching the damp earth in the bodies or excreta of infected insects, is maintained there, and enters the uninfected insects by punctures made by natural enemies. From some of the larvae of *Leptinotarsa* was obtained another bacillus morphologically and culturally similar to *B. leptinotarsae* but not pathogenic, as well as a non-pathogenic streptococcus.

HARTZELL (A.) & YOUDEN (W. J.). **Efficiency of Banding for the Control of Cankerworms.**—*Contr. Boyce Thompson Inst.* **7** no. 3 pp. 365–377, 3 figs., 1 graph, 5 refs. Yonkers, N.Y., 1935.

Outbreaks of *Alsophila pometaria*, Harr., and *Palaeacrita vernata*, Peck, occurred in a tract of woodland in the vicinity of New York in 1933, 1934 and 1935. Since banding the trees in an isolated section of the woodland in the autumn of 1933 failed to give satisfactory results, a special study was carried out in 1934–35 to determine the cause. The bionomics of the two moths are reviewed [*R.A.E.*, A **13** 24] ; the wingless females of *Alsophila* climb the trees to oviposit in autumn and those of *Palaeacrita* in spring. In October 1933 about 100 trees were banded at a height of 4 feet with a strip of cotton batting 2–3 ins. wide covered with a band of asphalt building paper 4 ins. wide drawn tight and tacked so that the ends overlapped, on which a uniform coat of tree tanglefoot about ¼ in. thick was applied. The tanglefoot and bands were renewed as required for the control of the moths then and in the spring and autumn of 1934 and the spring of 1935. The effect was estimated in 1924 and 1925 by determining the average weight of samples of 100 or 150 leaves taken from banded and unbanded trees, and it was found that the difference was less than 10 per cent. in favour of the banded trees. The larvae were numerous on these trees, though neither in spring nor autumn were any female moths observed to have succeeded in crawling over the bands. To determine whether the larvae had been blown to the trees by wind 8 screens covered with adhesive and facing in various directions were erected on a pole 20 feet high just north of the banded area. Examination of these shields at intervals demonstrated that the larvae are disseminated by wind, and the failure of banding is believed to be due to this.

NITSCHE (G.), KLEE (H.) & MAYER (K.). **Zur Bekämpfung der Rübenblattwanze** (*Piesma quadrata* **Fieb.**). [The Control of the Beet Leaf Bug.]—*NachrBl. dtsch. PflSchDienst* **15** no. 11 pp. 97–98, 1 chart, 2 maps. Berlin, November 1935.

A brief account is given of the infestation of beet in 1935 in German Silesia by *Piesma quadrata*, Fieb. For the first time the provision of trap strips of beet prior to sowing [*R.A.E.*, A **24** 17], was made compulsory in one district and gave successful control.

SATTLER (—). **Erneutes Massenauftreten der Runkelrübenmotte** *Phthorimaea* (*Lita*) *ocellatella* **Boyd in Hessen.** [A fresh Outbreak of *P. ocellatella* in Hessen.]—*NachrBl. dtsch. PflSchDienst* **15** no. 11 pp. 98–100, 3 figs. Berlin, November 1935.

The first serious infestation of beet in Germany by *Phthorimaea ocellatella*, Boyd, occurred in 1921 in Hessen [*R.A.E.*, A **10** 257], and the warm, dry summer of 1934 promoted a second outbreak there. Within the area of infestation, which in places was very sharply limited, nearly every fodder-beet plant was attacked. There were 3 generations in 1934, the third causing the injury. The adults of the second began to emerge at the end of August and oviposited during September. The generations overlapped, because the adults emerged irregularly, were long-lived and paired repeatedly during the oviposition period. Several eggs were laid on a leaf, into which the larvae bored on hatching. When older, the larvae attacked the stalks of the heart leaves at the base. Under conditions favourable to the plant, new heart-leaves may be put forth if the larvae have left to pupate. The larvae pupated in very dry situations, so that pupae were hardly ever found in the plants. The weather in 1921 and 1934, especially in the important months of July, August and September, was unusually favourable to *P. ocellatella*. Meteorological data indicated another outbreak in the autumn of 1935, and it actually occurred in September. The sugar content of fodder- and sugar-beet that had suffered severe attack was reduced by 25 per cent.

LINDINGER (L.). **Neue Beiträge zur Kenntnis der Schildläuse (Coccidae).** [New Contributions to the Knowledge of the Coccids.]—*Ent. Jb.* **45** (1936) pp. 148–167. Leipzig [1935].

The author discusses the synonymy of various Coccids and states that *Mytilococcus*, Amerling 1858, is an earlier name for the genus *Lepidosaphes*. A list is given of 304 additions to the species in the author's " Coccid Book " [*cf. R.A.E.*, A **23** 103].

MERKEL (L.). **Amtliche Pflanzenbeschau im Freihafen.** [Official Plant Inspection in 1933 and 1934 in the Free Harbour, Hamburg.]—*Jber. Inst. angew. Bot. Hamburg* **51** (1933) & **52** (1934) pp. 85–97. Hamburg, 1935.

HAHMANN (C.). **Abteilung für Pflanzenschutz.** [Plant Protection Division.]—*T.c.* pp. 98–129.

These reports, which are on the same lines as those for the preceding year [*R.A.E.*, A **22** 5], include records of insect pests of plants, etc., intercepted in or observed in or near Hamburg.

WEBER (H.). **Hemiptera III.**—*Biol. Tiere Deutschlands,* Teil 31, pp. 209–355, 100 figs., 3 pp. refs. Berlin, Borntraeger, 1935. Subscription price *M*.13.20 ; single copies *M*.24.

This third section on the Rhynchota in this work [*R.A.E.*, A **20** 80] comprises a general account of the morphology and biology of the Aphids and Coccids, followed by a brief general discussion of the relations of Rhynchota to their environment.

ENSER (K.). *Parlatoria oleae* **Ldgr.—als Doppelgänger der San José-Schildlaus.** [*P. oleae* as a Double of the San José Scale.]—*Neuheiten PflSch.* **28** no. 5 pp. 129–132, 2 figs. Vienna, October 1935.

Fruits grown in Austria have been infested by *Aspidiotus ostreaeformis,* Curt., *Epidiaspis leperii,* Sign., and *Lepidosaphes ulmi,* L. These Coccids, and especially the first two, produced red spots similar to those regarded as characteristic of the San José scale [*Aspidiotus perniciosus,* Comst.], but without deformations of the type associated with the latter.

In the summer of 1935 pears imported from Italy were infested by living examples of *Parlatoria oleae,* Colv., a Mediterranean species that produces deformations closely resembling those caused by the San José scale. *P. oleae,* the characters of which are described, is unlikely to become established in Austria.

NEUWIRTH (—) & BLATTNY (—). **Die Bekämpfungsversuche an Rüsselkäfern auf den Staatsgütern Südmährens im Jahre 1934.** [Experiments in the Control of Weevils in the State Farms in South Moravia in 1934.]—*Z. Zuckerindustr. čsl. Repub.* **59** pp. 281–284, 1935. (Abstr. in *Neuheiten PflSch.* **28** no. 5 p. 140. Vienna, October 1935.)

In South Moravia, *Bothynoderes punctiventris,* Germ., appears in the beet fields at the end of March and *Otiorrhynchus ligustici,* L., in the second week of April. Trenches to catch the migrating weevils should be dug in February or March round beet fields of the current and preceding years and also round lucerne fields from which *Otiorrhynchus* migrates to beet. The trenches should be 6 ins. wide and 12–16 ins. deep with vertical sides, and the weevils should be swept into holes in them and destroyed. Another measure consists in poisoning the weevils on trap strips of early sown beet.

KAUFMANN (O.). **Bekämpfung von Rübenwanze und Rübenfliege.** [Control of the Beet Bug and Beet Fly.]—*Mitt. Landwirtsch.* 1935 p. 398. (Abstr. in *Neuheiten PflSch.* **28** no. 5 p. 144. Vienna, October 1935.)

In German Silesia, the best control of the beet bug [*Piesma quadrata*, Fieb.] has been obtained with trap strips of early sown beet, which are ploughed as soon as all the bugs are on them. It is advisable to begin sowing the main crop of beet before this migration is completed. Where infestation by the beet fly [*Pegomyia hyoscyami*, Panz.] is expected, sowing and thinning should be effected as early as possible. When the flies appear, a bait-spray of sweetened sodium fluoride should be used.

GERARD (W. J.). **Bees and Derris Dust.**—*Bee World* **16** no. 11 p. 121. Berkhamsted, November 1935.

In June 1934 microscopic examination of dead bees that had been working on raspberry blossoms recently dusted with derris showed that the entrances to the tracheae were covered with the dust, picked up while gathering pollen. The bees had probably been suffocated. Quantities of dead brood had apparently been poisoned by feeding on the contaminated pollen. A man who had been applying the dust stated that the bees went down before it in thousands.

BELJAVSKY (A. G.). **The** *Mutilla europaea* **L. as a Bee Enemy.**—*Bee World* **16** no. 11 p. 122. Berkhamsted, November 1935.

Both sexes of *Mutilla europaea*, L., are briefly described. The female, which is usually wingless, lays its eggs in wasps' nests, where the larvae feed on the wasp larvae ; in Italy the author took 3 females from a nest of *Polistes gallicus*, L. Little is known about the life-history of this Mutillid. It is reported from Austria that if a single individual gets into a beehive it will kill 100 or more bees in a night ; it lays its eggs in the brood-cells, where the larvae hatch and pupate, and the bees are again attacked by the emerging adults.

HERING (M.). **Die Blatt-Minen Mittel- und Nord-Europas.** [The Leaf-Mines of Central and North Europe.]—Lief. 1, pp. ix–xii, 1–112, 122 figs. Neubrandenburg, G. Feller, 1935. Subscription price, *M*.12 per Lieferung ; separately *M*.18.

This series of keys to the leaf-mines due to insects in central and northern Europe is arranged under the generic names of the food-plants. Six parts are planned to appear within about 2 years. This first part includes descriptions of 3 new Phytomyzids and 2 new Tenthredinids, and notes on the biology, breeding and preparation of leaf-miners and on the difficulties of identifying mines. Keys are given from *Abies* to *Bromus* (part).

[YAKHONTOV (V. V.).] **Яхонтов (В. В.). A new Pest of** *Abutilon avicennae*—*Carcharodus althaeae* **subsp.** *baeticus*, **Abt.** [*In Russian.*]—*Sotzial. Nauka Techn.* no. 10–11 pp. 125–126. Tashkent, 1934. [Recd. November 1935.]

Between 1926 and 1930, larvae of *Carcharodus althaeae* subsp. *baeticus*, Rmb., were observed in large numbers on *Abutilon avicennae* and *Althaea officinalis* growing wild in widely separated localities in Uzbekistan. In view of the possibility of this Hesperiid attacking these plants under cultivation, notes on its bionomics are given, and the adults and larvae are briefly described. There are at least two generations a year. In Bokhara, young larvae appeared in late April or early May. They rolled the leaves of their food-plant, and fed and pupated in the shelter thus formed. The larval and pupal stages lasted about 6 and 1½ weeks respectively. The adults oviposited within a few days of emergence, and young larvae of the second generation appeared between 23rd and 26th June. An Ichneumonid of the genus *Anilastus* was reared from the larvae.

[YAKHONTOV (V. V.).] **Яхонтов (В. В.). An Ally of the Cotton Grower—the acariphagous Thrips** (*Scolothrips acariphagus* **Yakh.**). [*In Russian.*]—*Sotzial. Nauka Techn.* no. 12 pp. 96–98, 7 refs. Tashkent, 1934. [Recd. November 1935.]

A detailed redescription is given of *Scolothrips acariphagus*, Yakh., a predacious thrips originally described from convolvulus (*Zool. Anz.* **83** pp. 273–274. Leipzig, 1929). It has been found to be one of the most important of the natural enemies of the mite attacking cotton in Central Asia, which is here referred to as *Tetranychus telarius*, L. (*althaeae*, v. Hanst.), and it has previously been erroneously recorded in this connection as *S. sexmaculatus*, Perg. [*R.A.E.*, A **2** 313 ; **16** 669]. In 1928 it was particularly abundant near Old Bokhara and Tashkent.

[GILYAROV (M. S.).] **Гиляров (М. С.). An entomological Valuation of the Dates of Sowing of the Tau-Saguiz in the Ukraine.** [*In Russian.*]—*Sovetsk. Kauch.* no. 2 pp. 17–19. Moscow, 1935.

Infestation of the rubber-producing plant, tau-saghuiz [*Scorzonera tau-saghiz*], by insect pests in the southern Ukraine was studied in 1934, with special reference to dates of sowing. It was found that plants sown late in autumn or early in spring are attacked by only a small number of the usual soil pests, such as wireworms, Cistelids and Lamellicorns [*cf.* next paper]. The larvae of *Anisoplia austriaca*, Hbst., are practically harmless in the spring, when they feed almost exclusively on the humus, and the larvae of *Euxoa segetum*, Schiff., do not appear before June, when the plants are fairly well developed and capable of withstanding the injury caused. A considerable number of young plants (chiefly those sown early in spring) are destroyed by flea-beetles and the weevil, *Tanymecus palliatus*, F., but these pests are only active for a short period, and the flea-beetles may be attracted to strips of early maturing crucifers.

If sown at the end of June or early in the autumn, the plants are attacked by wireworms, etc., *A. austriaca*, *E. segetum*, root Aphids and ants. In fields sown in June, 50–60 per cent. of the sprouting plants were killed by Aphids and ants, and of the plants sown on 1st August 50 per cent. were destroyed by the larvae of *A. austriaca*, 25 per cent. by *E. segetum*, and about 15 per cent. by wireworms, etc.

Thus the best time for sowing appears to be late autumn, as the most important pests are avoided and the plants are sufficiently developed to recover from the attacks of flea-beetles and *Tanymecus* in spring.

[GILYAROV (M.) & LUK'YANOVICH (L.).] **Гиляров (М.) и Лукъянович (Л.). On the Standards of the Infestation of the Soil with Pests.** [*In Russian.*]—*Sovetsk. Kauch.* no. 3 pp. 18–22. Moscow, 1935.

As numbers of rubber-producing plants in the Ukraine have been destroyed by insects that attack the roots [*cf. R.A.E.*, A **23** 339], investigations were carried out in 1934 in a selected locality to determine the maximum numbers of such pests per square metre [10·76 sq. ft.] of soil that would permit the cultivation of tau-saghuiz [*Scorzonera tau-saghiz*] and kok-saghuiz [*Taraxacum* sp.] without the application of control measures. As these plants usually have only a single tap root, which remains rather thin during the first year of their growth, they are especially susceptible to soil pests. *Scorzonera*, the root of which is sweetish, appears to be more attractive to such pests than *Taraxacum*, which has a bitter root. Owing to a difference in root structure, it is also more susceptible to the damage caused, and its root is more liable to infection with diseases. The rate of infestation that permits cultivation is therefore slightly higher for *Taraxacum* than for *Scorzonera*. Of the Lamellicorn larvae found, *Pentodon idiota*, Hbst., was the most injurious, one mature larva sometimes severely damaging 4 or 5 roots of *Taraxacum* a day, each measuring 7–10 mm. in diameter. In a field of *Scorzonera* sown on 1st June it had destroyed 17·4 per cent. of the plants by 1st September, though the larvae only occurred at the rate of 0·12 per sq. m. It is suggested, therefore, that the presence of more than 0·5 larva per sq. m. should prohibit the sowing of either *Taraxacum* or *Scorzonera*. In the case of the larvae of *Amphimallus solstitialis*, L., which are smaller and less voracious, the number may be increased to 1 per sq. m. The larvae of *Anisoplia austriaca*, Hbst., do not cause appreciable damage to *Taraxacum*, and *Scorzonera* may be sown late in autumn or early in spring if not more than 3–4 larvae occur per sq. m. If it is sown early in autumn, however, the presence of 2–4 larvae per sq. m. is dangerous. Wireworms, of which only *Agriotes sputator*, L., and *A. gurgistanus*, Fald., were common and abundant, and the Cistelids, *Omophlus proteus*, Kirsch, and *Podonta daghestanica*, Reitt., only slightly damaged the plants; it appears possible to cultivate *Taraxacum* if the number of larvae of these four species does not exceed 5–6, 3–4, 5–6 or 5–7 per sq. m., respectively, and *Scorzonera* if the corresponding figures are 3–4, 2–3, 3–4, and 3–4. These figures may, however, have to be altered under different conditions of soil, plants, etc. The plants are less attacked if the soil is damp and rich in organic matter, on which the larvae feed. Sparsely sown plants suffer more from the attacks of the pests.

[VAVILOV (I. F.) & MUKHITDINOVA (N. M.).] **Вавилов (И. Ф.) и Мухитдинова (Н. М.). Substitution of Lime for Soap in Solutions of Anabasine Sulphate.** [*In Russian.*]—*Social. Grain Fmg* **5** no. 4 pp. 96–101, 7 refs. Saratov, 1935. (With a Summary in English.)

In the Russian Union, anabasine sulphate is largely used as an insecticide, soft soap or sometimes lime being added to the spray [*R.A.E.*, A **21** 579]. The authors consider that the great variations in the concentrations of anabasine sulphate required are probably due to differences in the hardness of water employed. The soap serves to liberate the free alkaloid ; but when the water is hard, much of the soap reacts with the calcium and magnesium salts present, so that the harder the water, the less toxic is the solution of anabasine sulphate with the same amount of soap. In the Crimea in 1934, solutions of 0·1 per cent. anabasine sulphate were tested on *Myzus* (*Myzoides*) *persicae*, Sulz. The Aphids were immersed by a method already noticed [**19** 681], but to wet them evenly the test tubes were slowly rotated round their perpendicular axis first in one direction and then in the other. Each test lasted 2 minutes, after which the Aphids were kept at 25°C. [77°F.] and 70–75 per cent. relative humidity for 24 hours, and the dead and living individuals were counted. Distilled water was used in the control. The solutions were prepared with distilled water and water taken from a well and a river, the degrees (German) of hardness of which were 9·8 and 16·6, respectively, and were applied alone or with the addition of 0·1 per cent. soap or 0·2 per cent. lime. When anabasine sulphate was used alone, the mortality percentages were 19·15, 47·56 and 60·2 in distilled, well and river water respectively. With soap the corresponding figures were 98·91, 88·04 and 94·68 ; and with lime 53·06, 63·54 and 82·95. The author considers that alkaline earths in the hard waters liberated part of the alkaloid and that the toxicity of the hard water solutions was decreased by the addition of soap because it softened the water. To determine the best proportion of lime in sprays prepared with the well water, it was added at the rate of 0·2–0·8 per cent. to 0·1 per cent. anabasine sulphate. The highest mortality (74·47 per cent.) was obtained with 0·3 per cent. lime.

[PILYUGINA (O. A.).] **Пилюгина (О. А.).** *Chaetocnema breviuscula* **Fald. (Sugar Beet Flea-beetle) and its Control.** [*In Russian.*]—*Social. Grain Fmg* **5** no. 4 pp. 102–118, 12 figs., 1 graph, 11 refs. Saratov, 1935. (With a Summary in English.)

An account is given of detailed field and laboratory studies carried out in the Saratov region in 1927–30 on *Chaetocnema breviuscula*, Fald., which is the most important pest of sugar-beet, often destroying an entire crop. All stages of this Halticid are described. The overwintered adults appeared in the spring soon after the snow melted, a mean temperature of 13°C. [55·4°F.] being the optimum. They lived 30–78 days in the insectary and did not die out in the field until late August or September. Females were much more numerous than males and usually lived a little longer. Pairing and oviposition occurred from May till the end of August. The eggs were sometimes laid on the surface of the soil, but chiefly at a depth of 1–2 ins. along the roots of young beet plants or the lateral roots of *Atriplex* and *Chenopodium.* Slightly damp soil favoured their development, but they were rapidly killed if it was too moist. The larvae, which hatched in 12–14 days, occurred in the soil (at a depth of 8 ins. or less) from the second half of May to the beginning of September. They fed on the roots of *Chenopodium* and *Atriplex,* but only occasionally on beet. The larval stage lasted 28–30 days and the pupal about half as long. Pupation usually took place at a depth of 1–3 ins. The young adults emerged from the second week in July onwards with undeveloped ovaries, and in this state they entered hibernation.

As soon as the young sprouting beet appears, the overwintered beetles migrate to it from weeds and feed on the cotyledons, stems and leaves. In the second half of the summer, when the beet leaves become coarser, the beetles prefer the foliage of young *Chenopodium* and *Atriplex*, but if abundant, they also attack the younger leaves of beet. Laboratory investigations showed that injury at the beginning of the vegetation period did not decrease the sugar content of the beet, whereas the damage to young leaves in the second half of the summer reduced it considerably. In July 1928 some of the flea-beetles were preyed upon by the larvae of *Chrysopa perla*, L., and some of the females were found to contain a Nematode in the abdomen.

Experiments to determine the best dates for sowing beet to safeguard it from infestation, and the resistance of different varieties gave inconclusive results. Insecticides tested included infusions of 5–20 lb. tobacco dust steeped in 12 gals. water for periods ranging from 6 hours to 7 days. Analysis showed that the 24-hour infusions contained the highest percentages of nicotine. Of these, an infusion of 10 lb. tobacco dust to 12 gals. water (0·08 per cent. nicotine) proved the most toxic, killing all the beetles in Petri dishes in 20 minutes. When sprayed in the field, however, it gave uneven results, the rate of mortality ranging from 0 to 75 per cent. Of stomach insecticides, calcium arsenate dust gave 100 per cent. mortality both on potted plants and in the field. It did not scorch the leaves or impede the development of the plants, and in good weather adhered to them for 5–7 days. Lead arsenate and other dusts were less effective.

VOLOŠČUK (WOLOSCHUK) (V.). **Ueber eine neue, in Speichern vorkommende Milbe.** [On a new Mite occurring in Granaries.]—*C. R. Acad. Sci. URSS.* (N.S.) 1935 **3** no. 2 pp. 95–96, 1 fig. Moscow, 1935.

Rhizoglyphus echinopus var. *noginae*, n., the distinguishing characters of which are given, was found in large numbers infesting stored wheat in the Crimea. The mites fed and oviposited in the grains, particularly when they were damp. The life-cycle was completed in 20–30 days, and favourable conditions for development were afforded by grain with a humidity of 16–18 per cent. or more.

RUSZKOWSKI (J. W.). **Szkodniki zbóż obserwowane w Polsce w r.1931.** [Pests of Cereals observed in Poland in 1931.]—*Roczn. Ochr. Rośl.* (B) **2** fasc. 2 reprint 4 pp. Warsaw, 1935. **Szkodniki sadów obserwowane w Polsce w r.1931.** [Pests of Orchards observed in Poland in 1931.]—*T.c.* reprint 16 pp. **Szkodniki roślin polnych i warzywnych (z wyjatkiem zbóż, buraków, chmielu i tytoniu) obserwowane w Polsce w latach 1931, 1932 i 1933.** [Pests of Field Crops and Vegetables (with the Exception of Cereals, Beet, Hops and Tobacco) observed in Poland in the Years 1931, 1932 and 1933.]—*T.c.* reprint 33 pp. **Szkodniki wielożerne pól i warzywników obserwowane w Polsce w latach 1931, 1932 i 1933.** [Polyphagous Pests of Fields and Kitchen Gardens observed in Poland in the Years 1931, 1932 and 1933.]—*T.c.* reprint 13 pp.

These papers contain lists of pests, chiefly insects, recorded from various districts in Poland, with brief notes on their local distribution, abundance and food-plants. The second paper deals with small fruits as well as fruit trees, and the third with fodder grasses, sunflowers, flax, hemp, poppy and vegetables.

Karpiński (J. J.). **Les causes qui limitent la reproduction de Bostryches typographes** (*Ips typographus* **L. et** *Ips duplicatus* **Sahlb.) dans la forêt primitive.** [*In Polish.*]—*Trav. Inst. Rech. For.* (A) **15** pp. 1–86, 8 pls., 13 graphs, 44 refs. Warsaw, 1935. (With a Summary in French.)

This paper records the results of investigations in September–November 1933 on the activities of *Ips typographus*, L., and *I. duplicatus*, Sahlb., on spruce in the forest of Bialowies. A list is given of the other bark-beetles found in the forest [*cf. R.A.E.*, A **21** 431, etc.] and their distribution in the different types of stands in which spruce is of importance is discussed with special reference to that of *I. typographus* and *I. duplicatus.* A separate chapter deals with the natural factors that check the increase of these two beetles in the forest. These are: conditions of overcrowding; woodpeckers; Nematodes; predacious insects, a list of which is given; Hymenopterous parasites, especially *Coeloides bostrychorum*, Giraud, and *Dendrosoter middendorffi*, Ratz., which attack the larvae of both *I. typographus* and *I. duplicatus*, and *Ipocoelius seitneri*, Ruschka, which attacks the adults; the fungus, *Beauveria* sp., which is recorded from these Scolytids for the first time; various non-parasitic fungi, which often abound in the galleries in the presence of dead larvae, pupae and young adults and may have been the direct or indirect cause of their death; the dwarf bark-beetles, *Crypturgus cinereus*, Hbst., *C. pusillus*, Gyll., and *C. hispidulus*, Thoms., which penetrate into the galleries of *I. typographus* and *I. duplicatus* and destroy all stages of them; and climatic factors, dry, warm weather favouring the increase of the beetles, which produce a second generation when an early spring is followed by a protracted summer. The effects of each of these factors are summarised in a table, and the conditions in which it finds its optimum are discussed at length. In the case of *I. typographus*, the mean percentages killed were 17·6 by overcrowding, 29 by woodpeckers, and 50·8 by all the other factors together, leaving an average of only 2·6 per cent. that emerged as adults. In the case of *I. duplicatus* the corresponding figures were 60·9, 8·7, 25·1 and 5·3. As these figures surpass any result that could be obtained by artificial control measures, the latter can only be effective if they supplement the natural factors. The measures suggested include the use of trap-logs on which the beetles would concentrate and thus create conditions of overcrowding; the protection of woodpeckers; and barking infested trees (standing or felled) immediately before the young adults begin to leave them, in order to expose the larvae, pupae and soft-winged adults in the galleries. The bark removed should not be destroyed, since large numbers of the immature stages of predacious and parasitic insects would be destroyed with it. Since many of these live under the bark, dead trees should be left standing until the summer of the following year to give time for them to emerge and for fungi to develop. The litter also harbours predators and other enemies of bark-beetles and should not be removed.

Box (H. E.). **The Food Plants of American** *Diatraea* **Species.**—4to, 11 pp., 64 refs. Trinidad, 1935.

This paper consists of a systematic list of the American species of *Diatraea* [*cf. R.A.E.*, A **19** 376; **23** 760], showing their distribution and known food-plants, which are classified according to their ecological status ; a systematic list of the food-plants, showing their habitat and distribution ; and an alphabetical one showing each food-plant with the species of *Diatraea* that attack it and the localities in which they do so, with references to the literature. An extensive bibliography is appended.

Salmón de los Heros (A.). **El control de las moscas de la fruta mediante trampas provistas de substancias atractivas.—Ensayos al respecto.** [Experiments on Fruit-fly Control by Means of Traps baited with Attractants.]—*Bol. Direcc. Agric. Ganad.* **5** no. 18 pp. 73–86, 4 figs., 1 col. pl., 7 refs. Lima, 1935.

Experiments in trapping *Anastrepha peruviana*, Tns., and *A. serpentina*, Wied., in the Rimac Valley, Peru, in 1934 are described in detail. Four types of glass bottle traps and 69 different baits (with plain water as a control) were tested. It was concluded that trapping is of value in control. The best form of trap was a conical flask (that is corked in the usual manner and suspended in the tree) with the bottom invaginated and in the centre of this a small opening through which the flies enter [*cf. R.A.E.*, A **18** 179]. The bait is contained in the rim of the bottom. Sweetened baits, fermented bran, vinegar, or mashed peaches, which are commonly recommended for *Ceratitis capitata*, Wied., were unsatisfactory against the Peruvian species. Fruit-juices were attractive and the best bait contained 40 per cent. of mashed ciruela del fraile [? *Bunchosia armeniaca*] and 60 per cent. water, the next best being a similar bait of banana. The best times for trapping are from early August to the end of January and from early March to the end of May.

Wille (J.). **El escarabajo " Serruchador " en la colonia de Satipo.** [The Twig Pruner in the Satipo Settlement, Peru.]—*Bol. Direcc. Agric. Ganad.* **5** no. 18 pp. 117–118. Lima, 1935.

The Prionid, *Derobrachus asperatus*, Bates, and the Lamiid, *Oncideres poecilla*, Bates, are recorded from an avocado stem from the settlement of Satipo, Peru.

Salmón de los Heros (A.). **Calendario de prácticas y tratamientos insecticidas y fungicidas para los meses de Abril a Setiembre, preparado especialmente para los valles de la costa central del Perú.** [A Calendar of insecticide and fungicide Work for the Months April to September, specially prepared for the Valleys of the Central Coast of Peru.]—*Bol. Direcc. Agric. Ganad.* **5** no. 18 pp. 137–147. Lima, 1935.

In this calendar orchard work predominates, but measures against some pests of agricultural crops are included.

Millán Medina (A.). **Cochinilla roja australiana** (*Chrysomphalus aurantii*). **Cochinilla roja comun** (*Chrysomphalus dictyospermi*). [*Aonidiella aurantii* and *C. dictyospermi*.]—*Bol. Dep. agríc.-ganad. Entre Rios* **1** no. 1 pp. 34–35. Parana, 1935.

Chrysomphalus dictyospermi, Morg., occurs throughout the *Citrus* regions of Argentina and *Aonidiella* (*Chrysomphalus*) *aurantii*, Mask., in many of them. The characters distinguishing the two species are tabulated.

HAYWARD (K. J.). **Un nuevo parásito de los citrus.** [A new Pest of *Citrus*.]—*Bol. Dep. agríc.-ganad. Entre Rios* **1** no. 2 p. 2. Parana, 1935.

Orthezia praelonga, Dougl., is recorded from *Citrus* in the province of Concordia, Argentina.

BENCE PIERES (R.). **Problema sanitario de Concordia.** [The Problem of Citrus Pests in Concordia.]—*Bol. Dep. agríc.-ganad. Entre Rios* **1** no. 2 pp. 11–12. Parana, 1935.

In the province of Concordia, Argentina, *Prontaspis* (*Chionaspis*) *citri*, Comst., and *Lepidosaphes beckii*, Newm., are the chief pests of *Citrus*. Both may be controlled by spraying with oil emulsions.

BAZÁN (R.). **El gusano del duraznero.** [*Cydia molesta*.]—*Bol. Dep. agríc.-ganad. Entre Rios* **1** no. 2 pp. 51–52. Parana, 1935.

Cydia (*Laspeyresia*) [*molesta*, Busck] attacks peach and, to a less extent, quince, apple, pear, damson, plum and other fruits in Argentina, where it was introduced a few years ago. Destruction of infested shoots and fruits, and the usual methods of orchard sanitation are recommended for its control.

BILSING (S. W.). **Creating an entomological Atmosphere in the South.**—*J. econ. Ent.* **28** no. 5 pp. 739–745. Geneva, N.Y., October 1935.

Emphasis is laid on the importance of preparing the public mind by disseminating information concerning the potential dangers of insect pests in order to obtain support when a campaign has to be initiated; and in order to stimulate enthusiasm, the accomplishments of a few pioneers in entomological work in the southern United States are reviewed. The manner in which the respective menaces of the boll weevil [*Anthonomus grandis*, Boh.] the pink boll worm [*Platyedra gossypiella*, Saund.] and the Mediterranean fruit-fly [*Ceratitis capitata*, Wied.] were dealt with there is quoted to show what might have been accomplished had the public mind been sufficiently prepared for the advice offered in the case of *A. grandis*, and what has been accomplished in the case of the other two pests. Particular stress is laid on the importance of the acquisition of fundamental information by research workers, and the inadequacy of so-called "practical courses" of entomology in agricultural colleges is pointed out. Some of the problems still remaining to be solved in the Southern States are briefly reviewed.

McDONALD (R. E.) & LOFTIN (U. C.). **Dispersal of the Pink Bollworm by Flight or Wind Carriage of the Moths.**—*J. econ. Ent.* **28** no. 5 pp. 745–755, 2 figs., 4 refs. Geneva, N.Y., October 1935.

Studies of the dispersal of *Platyedra* (*Pectinophora*) *gossypiella*, Saund., by flight or wind carriage have been made for several years in Texas and Mexico by means of aeroplane collections, flight screens, trap plots and observations of wind movement. The early work has already been noticed [*R.A.E.*, A **18** 62]. Moths were taken in aeroplane collections up to 3,000 ft. above ground level (6,700 ft. above sea level), and in large numbers on the flight screens, which consisted of L-shaped frames covered with screen wire coated with an adhesive. The screens were erected in two localities in or near fields of infested cotton, facing north and south or east and west. Tests were also made with revolving screens facing the wind. The screens were examined daily, boll infestation records were made once a week, and sweepings were taken three times a week in the cotton fields. Data obtained in both localities in 1928, 1929, 1930 and 1931 are given. In all records the greatest numbers of moths were taken in autumn after the infestation had become rather heavy. An average of 42 per cent. were females, and of 50 females examined in 1931, 72 per cent. contained mature eggs. Some of the trap plots at distances varying from 25 to 65 miles from the nearest cotton became infested late in the season in 5 of the 6 years, 1926–31, in which plantings were made.

The distinct localisation of infestation in the trap plots and the history of infestations to the north and north-east of the heavily infested Laguna district of Mexico could not be explained by the accidental carriage of infested material or voluntary flight of moths. This together with the rapid increase in field infestations after dates when most of the moths were taken on flight screens indicated that moths were coming from the Laguna district. The prevailing wind from this district is towards the United States, and areas infested in the western part of the United States are in the general direction of the wind currents. The total wind-movement in the Laguna district during September over the period 1920–31 was closely correlated with the intensity of infestation in Texas. All the indirect evidence indicates that the moths fly with or are carried by the wind for considerable distances. Rainfall seemed in some instances to stimulate migration.

RAINWATER (C.). **Preliminary Report on Cotton Root Aphids in South Carolina.**—*J. econ. Ent.* **28** no. 5 pp. 755–760, 5 refs. Geneva, N.Y., October 1935.

Anuraphis maidiradicis, Forbes (green cotton-root aphis), *Trifidaphis phaseoli*, Pass. (white cotton-root aphis) and *Rhopalosiphum* sp. (brownish-purple cotton-root aphis) were found injuring the roots of cotton in the Coastal Plains of South Carolina in 1934. *A. maidiradicis*, which had hitherto been supposed to be the only species responsible for root-injury to cotton, was the most widely distributed and was most abundant on the finer types of sandy soil. It occurred on cotton from 15th May to 20th July and afterwards on other plants until about 10th December. Injury ranged from an occasional stunted plant to the complete destruction of several rows. *T. phaseoli* is recorded for the first time on cotton in the United States, where it had previously occurred on the roots of sweet peas and beans. It was found on the roots of cotton from the first week in May till the first week in July, after which it disappeared. It occurred earlier and in greater numbers on individual plants than either of the other species, so that the damage caused locally was greater though the total damage was less than that caused by *A. maidiradicis*. No species of *Rhopalosiphum* has previously been recorded on the roots of cotton, and the one found in South Carolina may prove to be new. It was found in scattered colonies in the second week in May and occasionally during June, but caused considerable local damage. It was more injurious to okra [*Hibiscus esculentus*] and butter beans; about 40 per cent. of each were killed in one small field.

Relatively few cotton plants were killed by these 3 species, although in some badly infested fields one-third or more of the seedlings were destroyed. Possibly the greatest injury caused is stunting or dwarfing. Lists are given of 26 plants from which one or other of the Aphids have been taken, and of 7 species and varieties of ants found attending them on cotton; those more consistently present and attending all three Aphids were *Pheidole vinelandica*, For., and *Lasius niger* var. *neoniger*, Emery. Observations under insectary conditions were made by placing the Aphids singly on sprouted cotton seed in shell vials. *T. phaseoli* is fairly active in the first instar, but becomes less so with each moult. It is negatively phototropic, but positively geotropic and thigmotropic to an extreme degree, factors that make it difficult to rear. *A. maidiradicis* is much more active than *T. phaseoli*, but less so than *Rhopalosiphum*. Although gregarious, it can be reared singly but is very delicate. Its reactions to stimuli are less extreme than those of *T. phaseoli*. It usually moults 4 times and sometimes 5. *Rhopalosiphum* sp. is negatively phototropic, but geotropic and thigmotropic only to a very slight degree. Though gregarious, it can be reared singly with ease and is not delicate to handle. Average figures for 24 generations between 14th June and 1st December were 6·56 days for nymphal development at 78·8°F., and 8·1 for adult life at 76·4°F., the adults producing 4·4 nymphs per day.

FENTON (F. A.) & HIXSON (E.). **Effect of the 1934 Drought upon the Boll Weevil in Oklahoma.**—*J. econ. Ent.* **28** no. 5 pp. 760–765, 2 refs. Geneva, N.Y., October 1935.

The following are the authors' conclusions: In 1934 a severe drought effectively checked an early infestation of *Anthonomus grandis*, Boh., in Oklahama so that practically no damage was caused to cotton. Owing to extremely high temperatures, the weevil was almost exterminated in fallen squares. It was able to survive, however, in fairly large numbers in cotton bolls which were not affected by the heat. The broods of weevils emerging from the bolls in the late summer produced a large supplementary autumn generation in late squares, which were developed in unusually large numbers by the plants owing to heavy rains in September and November. Owing to late frosts, this large supplementary brood went into hibernation in good condition.

MOZNETTE (G. F.). **Recent Experiments in the Control of the Pecan Nut Case Bearer in the Southeast.**—*J. econ. Ent.* **28** no. 5 pp. 791–794. Geneva, N.Y., October 1935.

As most of the damage to pecan nuts caused by *Acrobasis caryae*, Grote, in the south-eastern United States is due to the first generation during May and June [*cf. R.A.E.*, A **19** 603], it was thought that one or two applications of a contact spray against the eggs and newly hatched larvae made during the last two weeks in May might protect the set of nuts when the greatest destruction normally occurs. Effective control was obtained in 1932 and 1933 with nicotine sulphate in combination with summer oil or fish oil. Summer oil emulsion alone was much less effective, and sprays containing pyrethrum or derris gave very unsatisfactory results. There appeared to be little difference in control between one and two applications of the nicotine-oil spray. No foliage injury was observed.

In further experiments in 1934 in a pecan orchard in Florida, the spray materials were used at the following concentrations: oil emulsion, ¾–100; fish oil ¼–100; nicotine sulphate 1–1,000; Bordeaux mixture, 2–2½–50. Two summer oil emulsions were used; the first contained 80·1 per cent. total oil by weight, the extracted oil having a viscosity of 63 seconds (Saybolt) and an unsulphonated residue of 92·8 per cent., and the corresponding figures for the second were 84·2, 61 and 96·8. Analysis of the fish oil showed specific gravity 0·929, free fatty acid calculated as oleic acid 8·3, iodine value (Hanus method) 145 and saponification value 195. Two applications of the first emulsion in combination with nicotine sulphate gave 97 per cent. control, but two applications of the emulsion alone gave only 42·8. One application of the second emulsion with nicotine sulphate gave 93 per cent. control, and 2 applications of nicotine sulphate and fish oil gave 98·7. A first application of nicotine-Bordeaux followed by one of nicotine-oil gave 95·4 per cent. control and the foliage was in much better condition throughout the season than that on the unsprayed trees. The latter showed an average infestation of 24·1 per cent. of the nut clusters and the average yield was about half as great as that from those receiving the most successful treatments. There was a slightly smaller proportion of larger nuts on trees receiving two applications of oil-nicotine than on those receiving only one application, and the proportion of large nuts was greatest on the untreated trees, where the thinning of the crop by *A. caryae* may have been responsible.

SWINGLE (H. S.). **Control of the Pecan Weevil.**—*J. econ. Ent.* **28** no. 5 pp. 794–796. Geneva, N.Y., October 1935.

About 70 per cent. control of *Curculio caryae*, Horn, on pecan was obtained in jarring experiments in Alabama in 1933 and 1934 [*cf. R.A.E.*, A **23** 414]. The peak of emergence is reached between 21st and 27th August, about which date the pecan kernels harden sufficiently for oviposition [*cf.* **19** 554]. Jarring should begin about 15th August in central Alabama and be repeated at weekly intervals until the first or second week in September. Trees having a limb-spread up to 60 ft. were successfully jarred by means of a padded pole applied lightly from the ground, 5 men with 2 sheets treating 15–30 trees an hour when the limbs were close to the ground. When the limbs were higher and it was necessary to climb the tree and jar the branches with the foot, the same number of men could treat only 5–8 trees in an hour. The cost of jarring for each treatment was 1½*d.* a tree for low spreading trees and 3*d.*–5*d.* for high top-worked trees. A saving of 1–4 lb. of nuts per tree compensates for the cost of jarring.

MARCOVITCH (S.). **Control of the Bean Weevil and the Cowpea Weevil.**—*J. econ. Ent.* **28** no. 5 pp. 796–797, 1 ref. Geneva, N.Y., October 1935.

As the quantity of lime recommended by Metcalf [*R.A.E.*, A **5** 208] to protect cowpeas from *Bruchus* (*Mylabris*) *quadrimaculatus*, F., was many times as great as that found adequate by the author to protect beans from *B. obtectus*, Say [**23** 69], tests were carried out in Tennessee to account for the discrepancy. It was found that 20 parts lime or 1 part sodium fluosilicate per 1,000 parts seed was sufficient for *B. obtectus*, whereas 500 parts lime or 2 parts sodium fluosilicate was required for *B. quadrimaculatus*. In individual tests of the effect of lime on the adults, 100 per cent. of the bean Bruchids and only 50 per cent. of the cowpea Bruchids were dead after 96 hours. The former lay their eggs loosely among the beans, and the larvae move about before entering them, but the eggs of the latter are glued over the surface of the cowpeas and the larvae enter the seeds beneath the point of oviposition without coming in contact with the dust. Thus in the case of *B. obtectus* the lime treatment is effective against both adults and larvae, so that less lime is needed to obtain control.

STANLEY (W. W.) & MARCOVITCH (S.). **Calcium Arsenate as a Control Measure for the Tobacco Flea Beetle and Hornworm.**—*J. econ. Ent.* **28** no. 5 pp. 797–801, 3 refs. Geneva, N.Y., October 1935.

Dusts tested under field conditions in Tennessee in 1933 and 1934 in an attempt to find substitutes for lead arsenate and Paris green, which have been commonly used for the control of the tobacco hornworm [*Protoparce* sp.] and the tobacco flea-beetle [*Epitrix parvula*, F.] respectively on tobacco, were calcium arsenate, natural and synthetic cryolite, Dutox (barium fluosilicate), derris and pyrethrum. Only Paris green injured the foliage seriously. Since, 15 years ago, calcium arsenate was considered unfit for use on account of risk of foliage injury [*R.A.E.*, A **11** 504], much progress has been made in standardising it and eliminating water-soluble arsenic from it. The best results against *E. parvula* were secured with Dutox or calcium arsenate. The number of beetles and quantity of dust applied were equivalent to the following per acre: 6,034 for 9·1 lb. Dutox, 11,150 for 7·6 lb. calcium arsenate and 41,000 for no treatment in 1933; and 24,299 for 8·4 lb. Dutox, 20,000 for 7·2 lb. calcium arsenate and 82,475 for no treatment in 1934. Against *Protoparce* lead arsenate (4·9 lb. in 1933 and 6·1 in 1934) was about as effective as calcium arsenate (7·6 and 9·1 lb.), these being the best materials. In tests in 1933 calcium and lead arsenates and natural cryolite, used as sprays (3 lb. per 50 U.S. gals. water), gave about the same control of *Protoparce* and *E. parvula* as when used as dusts. Flour or goulac (dry lignin pitch) were used as stickers with the cryolite, and lime was mixed with the calcium arsenate. Neither *Protoparce* nor *E. parvula* were much affected by dusts of either pyrethrum or derris, the toxicity of which quickly wears off.

In view of freedom from foliage injury, elimination of lead residue, low cost and high efficiency in the control of both *Protoparce* and *E. parvula* it is concluded that calcium arsenate is the most satisfactory material for dusting tobacco.

BARE (C. O.). **Some Remarks concerning the Egg Parasite,** *Trichogramma minutum* **Riley, in Florida.**—*J. econ. Ent.* **28** no. 5 pp. 803–815, 1 graph, 13 refs Geneva, N.Y., October 1935.

In the course of an attempt to control *Phlyctaenia rubigalis*, Gn., on celery in Florida by means of *Trichogramma minutum*, Riley, eggs of *Calpodes ethlius*, Cram., which is common on *Canna* and swamp lilies throughout the southern United States, were found in and after August 1927 to be parasitised by a new race of *T. minutum* similar to that from the same host in Haiti [*R.A.E.*, A **20** 353], but black or fuscous. A review of the literature shows the presence in the United States and Mexico of at least 7 races of *T. minutum* [*cf.* **18** 369 ; **19** 71, etc.], which complicates the problem of biological control by means of this parasite. Observations and experiments each year since 1927 have shown that the new race differs from the one usually found in eggs on wild food-plants in the neighbourhood of celery fields in central Florida. The latter is yellowish at summer temperatures and darker in winter and parasitised the eggs of *P. rubigalis* and many other insects, whereas the former remains black throughout the year at all temperatures and consistently refused to parasitise eggs of moths other than *Calpodes* upon which it was tried, including *P. rubigalis*, *Sitotroga cerealella*, Ol., *Plodia interpunctella*, Hb., *Ephestia kühniella*, Zell., and *Basilona imperialis*, Drury. More recently a single instance of successful parasitisation of eggs of *P. rubigalis* occurred in the laboratory, though no individual of the black race has ever been observed in thousands of emergences from eggs taken on celery in the field. A black *Trichogramma* closely resembling the *Calpodes* race has, however, been taken emerging from eggs of *Phlyctaenia tertialis*, Gn., found on elderberry growing in the midst of *Canna*. The yellow and black races, though morphologically indistinguishable, differ somewhat in size and method of ovipositing, and several attempts to make them interbreed failed. An average of 12·52 (minimum 7, maximum 22) of the *Calpodes* race emerged from individual parasitised eggs collected in several localities at intervals over a period of one year. The percentage of males ranged from 0 to 15·75, with an average of 14·16 out of 2,003 adults. The average percentage for the yellow race was 28. The percentage of parasitism of all *Calpodes* eggs collected ranged from 0 to 100 with an average of 66⅔.

In order to study the winter activity of *T. minutum* as a parasite of *P. rubigalis*, which normally develops during the winter season in Florida [**23** 483], plants bearing fresh host eggs were placed daily in various positions in celery fields from December 1930 to March 1931, examinations being made at intervals for parasitised eggs. Parasitism decreased from 39·2 per cent. in November to 0·75 in January, remaining very low until it rose to 10·72 in May. This decrease, which was not observed in more favourable seasons, was partly due to the unusually cold winter, though as emergence of *T. minutum* is known to take place at 60°F., and oviposition at 63°F., and the average monthly mean temperatures were above 60°F. except in December and January (57·4° and 58°F.), conditions must have frequently been favourable enough to permit emergence and oviposition. Infestation by *P. rubigalis* was very light during the winter 1930–31, and it is probable that many of the parasites failed to find hosts for oviposition.

Mass production of *T. minutum*, which was conducted during 1928–32, was constantly hindered by pests, including mites that attack the eggs and adults of *Sitotroga cerealella*, Ol., the host used in rearing the parasites, *Calandra* (*Sitophilus*) *oryzae*, L., which eats the grain, and *Tribolium castaneum*, Hbst. (*ferrugineum*, F.), which eats both the grain and the eggs of the host. Treatment of the grain with sulphur against the mites interfered with the rearing of the parasites [*cf. R.A.E.*, A **18** 70, 479]. Eggs of *S. cerealella* stored in an electric refrigerator with a temperature of about 36–48°F. failed to hatch after they had been kept about 10 days, but were parasitised more readily than fresh ones. They were useless if stored for more than 3 weeks, owing to desiccation. Mortality of the parasite pupae stored within host eggs in the refrigerator without protection from desiccation was also high after about a month.

The methods used in celery culture in Florida are described, and details are given of field liberations of *T. minutum* made there from 1928 to 1932. The following is taken from the author's conclusions: Even when large numbers of parasites were liberated in small areas there was only a slight increase in percentage of parasitism, and thickly distributed colonies of overwhelming numbers of parasites in celery rows where eggs of *P. rubigalis* were abundant only resulted in a moderately high percentage. There are a number of obstacles to the practical use of *T. minutum* against *P. rubigalis* in Florida. *P. rubigalis* can develop during the winter months at about 50°F., but the parasite develops only at about 63°F. As it has three or more generations to one of its host, it carries over in lessened numbers on the early and late individuals of the host generations together with the few auxiliary hosts, and it is difficult to build up parasitism. Many adults are killed by the frequent applications of sprays and dusts against diseases and other pests of celery, and where pyrethrum is applied against the larvae of *P. rubigalis*, practically all the parasite adults are killed, although most of the moths escape. The moths are stronger fliers and distribute themselves farther and more quickly. At harvest the immature parasites in the host eggs are removed with the celery, whereas the moths fly to adjoining fields. It is not possible to predict with certainty when seasons of commercial damage will occur. In five years' experiments infestation was severe only in one, and control measures were required only in two. Thus there are many seasons when parasite material will not be used, though it must be prepared, thus adding to the expense. As the present methods of artificial control are reasonably satisfactory, it is concluded that the use of *T. minutum* for the control of *P. rubigalis* under the conditions prevailing in Florida is too costly to be practical.

LARRIMER (W. H.). **Corn Earworm not controlled in Sweet Corn by Release of** *Trichogramma.*—*J. econ. Ent.* **28** no. 5 pp. 815–816. Geneva, N.Y., October 1935.

As the failure of *Trichogramma minutum*, Riley, to control *Heliothis obsoleta*, F., in field maize was thought to be partly due to its slow spread from the point of liberation, an experiment was carried out in Virginia in 1934 to see whether it would be more successful in small garden plantings. Six plantings of sweet maize were made at intervals of 2 weeks from 1st May to 10th July, each covering about $\frac{1}{5}$ acre and consisting of 4 plots, 2 for release and 2 as controls. Eggs of *H. obsoleta* were present throughout the season from 14th June, though they were rather scarce in mid-July. The parasites were liberated twice, 30,000 on 5th June and 40,000 on 19th July. Eggs of *H. obsoleta* were collected and reared throughout the season both from the plots and from fields adjacent to and distant from the experiment. With the exception of 5 that emerged from an egg of

Colias (*Eurymus*) sp. taken on clover on 18th May, the only adults of *T. minutum* were from 5 out of 20 eggs of *H. obsoleta* taken from the release plots on 31st August.

STONE (M. W.). **Technique for Life-history Studies of Wireworms.**—*J. econ. Ent.* **28** no. 5 pp. 817–824, 2 figs., 9 refs. Geneva, N.Y., October 1935.

Methods employed during 1929–33 in rearing large numbers of the wireworms, *Pheletes* (*Limonius*) *californicus*, Mann., *Melanotus longulus*, Lec., and *Drasterius* (*Aeolus*) *livens*, Lec., in southern California are described. Temperature control cabinets were used to determine the effect of different temperatures on quantity of food consumed and rate of development, and also for the exposure to high temperatures of dormant adults to hasten pairing and oviposition. The use of low temperatures immediately after emergence makes it possible to maintain dormancy for as long as 6 months and to retard hatching of the eggs. For rearing larvae out of doors, a drain-pipe cage [*cf.* *R.A.E.*, A **17** 227] was found most satisfactory. Pairs of drain pipes, 12 inches long and 6 inches in diameter, cemented together, were placed 6 inches apart in a trench 22 inches deep, allowing 2 inches of the top to remain above the soil surface so that screen cages could be attached and to prevent débris from washing in. The earth was then replaced in the trench and packed down, and the cages were closed at the bottom by a ½-inch layer of plaster of Paris. Soil was sifted to eliminate possible infestation by Elaterid larvae, and, after it had been placed in the cylinder, ¾ oz. carbon bisulphide was injected 2 inches below the surface to exterminate mites and eggs of parasitic Diptera. After all traces of carbon bisulphide had disappeared and wheat and maize had been distributed throughout, 25 newly-hatched larvae were buried in each cylinder at a depth of about 12 inches. They were fed with fresh grain monthly until they ceased activity in late autumn, and at intervals of 6 weeks during the winter months. A wire screen cage, fitted over the outside of the pipe, prevented the escape of the adults or oviposition by other insects. As larvae from one brood may mature in 1, 2, or 3 years, the soil must be sifted each year to obtain adults before normal emergence. Females pair immediately after emergence and then return to the soil to oviposit, so that a second brood is liable to develop in the same cage. Larvae may be injured when soil is examined or food added, or destroyed by infestations of ants, unless care is taken to protect them. Insufficient food resulted in starvation and even cannibalism, but an excess of sprouting grain diminished the moisture supply, causing desiccation of small larvae. The method employed for preparing soil for oviposition is described. Optimum moisture, which was found to be 12–16 per cent. by weight, was obtained by the addition of distilled or tap water to soil that had been previously dried, sifted and exposed to 140°F. for 2 days to kill fungi and mites.

The adults were allowed to oviposit in soil in a metal cylinder with a screen wire cage on the top or in salve cans in which individual mated pairs were placed. The time of hatching was determined by washing the soil through a 30 mesh screen and examining the eggs at frequent intervals, and newly-hatched larvae were removed individually to salve cans filled with fine soil (60 mesh) containing 3–4 sprouted kernels of wheat. The soil was changed monthly, a coarse soil (14 mesh) being used as soon as the larvae grew bigger. A surplus of 10–20 water-soaked wheat kernels was added each time the soil was changed. Soaked wheat is more easily penetrated and prevents the loss of soil moisture while kernels are germinating. Devices for obtaining the cast skins of larvae are described. The older larvae were fed in captivity according to the conditions prevailing in the field at the season, very little food being supplied during the semi-dormant period, and an excess during periods of activity, and the pre-pupae and pupae were placed in small depressions in the soil in salve boxes where they were examined each day until pupation and emergence occurred. Adults required for mating were confined in salve cans in moist soil during the winter months or, if they had pupated in the drain-pipe cages, were allowed to remain in the pupal cells until a month before normal emergence. They were removed from the soil before emergence to prevent mating. In a salve can the adult was provided with an artificial pupal cell, the opening of which was covered with additional soil to retard drying and prevent its escape to the surface. Large numbers of adults were carried through the winter with only light mortality by this method. When the temperature remained below 70°F., a 40-watt globe, placed for a few minutes in a glass battery jar in which a number of adults of both sexes taken from salve cans or drain-pipe cages had been placed, had a tendency to stimulate activity and subsequent pairing.

CARTER (R. H.). **An Investigation of Solvents for the Removal of insecticidal Fluorine Residues from Fruits.**—*J. econ. Ent.* **28** no. 5 pp. 829–831, 5 refs. Geneva, N.Y., October 1935.

The solubility of cryolite in a number of solvents was determined by the following procedure : A mixture of 5 gm. cryolite and 200 cc. solvent at 20°C. (68°F.) was shaken vigorously for 3 minutes and then filtered rapidly through paper. Aliquots of the filtrate were distilled according to the procedure of Willard and Winter [*R.A.E.*, A **21** 419] with sulphuric acid. Aliquots of the distillate were then titrated with standard thorium nitrate solution, sodium alizarin sulphonate being used as indicator. The results with the solvents used and their concentrations are shown in a table. It was found that hydrochloric acid is a fairly good solvent for cryolite. Sodium salts, when added to water or to dilute hydrochloric acid, repress the solubility of cryolite, whereas some other compounds, such as boric acid and aluminium and ferric salts, increase it [*cf.* **22** 651]. Of the alkaline compounds tested sodium hydroxide was much the best. Solutions of sodium silicate, sodium carbonate and bicarbonate and tri-sodium phosphate do not effect decomposition of cryolite. It is concluded that compounds that increase the solubility of cryolite will be of value in removing spray residues containing fluorine from fruit, but the relative efficiency of these compounds can only be determined by practical tests.

SEARLS (E. M.). **Further Studies on the Effect of Controlling the Potato Leafhopper (*Empoasca fabae* Harris) in Alfalfa by designed Cutting.**—*J. econ. Ent.* **28** no. 5 pp. 831–833, 1 ref. Geneva, N.Y., October 1935.

Plots of lucerne that had been mown early or late, with or without spraying, for the control of *Empoasca fabae*, Harr., in Wisconsin in 1933

[*R.A.E.*, A **22** 277] were cut on 11th or 12th June 1934. Sprayed parts of plots cut early in 1933 yielded 5,197 lb. lucerne per acre in June 1934, whereas the unsprayed parts of the same plots yielded 3,237 lb. per acre, showing an increased yield of 60·5 per cent. where *E. fabae* had been controlled. The unsprayed areas contained about twice as many weeds as the sprayed. The unsprayed areas of the late mown plots produced 5,495 lb. to the acre, so that deferred mowing was at least as effective as intensive spraying combined with early mowing. The sprayed areas in the late mown plots produced only 644 lb. more lucerne to the acre than the unsprayed and contained only 2 per cent. less weeds. These observations showed that where severe infestation by *E. fabae* was uncontrolled either by spraying or deferred mowing, it seriously interfered with the ability of the plants to maintain their productivity, owing to reduced vitality caused by alfalfa yellows combined with encroachment by weeds.

HUTCHINS (R. E.). **Corn Earworm fails to overwinter at Ames, Iowa.**—*J. econ. Ent.* **28** no. 5 p. 833. Geneva, N.Y., October 1935.

No adults of *Heliothis obsoleta*, F., were found in the spring of 1935 in central Iowa in screen cages placed over sod and cultivated ground in the soil of which larvae had pupated late in 1934. Pupae dug in maize fields in March were all dead. During part of the winter of 1934–35 the ground was covered with 4–5 inches of snow, and the temperature dropped as low as −28°F. Up to 6th July 1935 no delayed emergence of adults had been observed. This appears to confirm the theory that *H. obsoleta* does not overwinter as far north as central Iowa.

BECKER (W. B.). **Evidence of the European Elm Bark-beetle found in western Massachusetts.**—*J. econ. Ent.* **28** no. 5 p. 833. Geneva, N.Y., October 1935.

The finding of *Scolytus multistriatus*, Marsh., in specimens of elm wood and bark from three localities in western Massachusetts in 1935 is thought to represent a spread from the New York infestation, which extends to neighbouring points in Connecticut and New York State, rather than from that centred around the city of Boston, the limits of which are far removed.

CORY (E. N.). *Calomycterus setarius* **Roelofs in Maryland.**—*J. econ. Ent.* **28** no. 5 pp. 833–834. Geneva, N.Y., October 1935.

Calomycterus setarius, Roel. (Japanese weevil) was observed in July 1935 invading two neighbouring houses surrounded by fields of grass, clover and weeds in Maryland. The weevils had also occurred there in the previous year. They were entering the houses in large numbers over a period of 3 weeks and had destroyed almost all the foliage of roses and ivy growing round them. They also attacked marigold and other plants. No pairing was observed either under natural conditions or in cages.

FELT (E. P.). **Lights for Light Traps.**—*J. econ. Ent.* **28** no. 5 p. 834. Geneva, N.Y., October 1935.

On the basis of a communication from an expert on electric lighting, attention is drawn to the necessity for a complete knowledge of the characteristics of the source of light in making accurate comparisons of the attractive or repelling power of different types of electric lamps for insects. In the absence of such knowledge differences attributed to variations in colour quality may actually be due to varying intensities of light. In work with coloured lights, the total output of luminous flux and perhaps also the visible candle power should be taken into account. The amount of energy produced in each band of the spectrum should be measured and the differences between the different qualities of ultra-violet lights noted. The ultra-violet quality of the average lamp is altered by even slight changes of temperature and pressure. The newest illuminants in the hot cathode or high intensity mercury or sodium lamps produce broken line spectra which are also quite sensitive to external conditions.

BISSELL (T. L.). **Insects infesting Cottonseed Meal.**—*J. econ. Ent.* **28** no. 5 p. 835. Geneva, N.Y., October 1935.

Insects taken during August 1935 from locally ground cottonseed meal of the 1934 crop stored in burlap bags in Georgia were *Lasioderma serricorne*, F., *Sitodrepa panicea*, L., *Tenebroides mauritanicus*, L., *Attagenus piceus*, Ol., *Tribolium confusum*, Duv., and *Ephestia kühniella*, Zell. Such meal might become infested through the fabric of the bags, or owing to the use of second hand bags, which are likely to contain insects on residues of food material. On the other hand, though cottonseed cake is dense and does not appear suitable for insects, except possibly at the edges, eggs or larvae in it might survive the process of breaking it up into meal, which immediately precedes bagging.

SHAW (F. R.), BOURNE (A. I.) & LOTHROP (C. L.). **Notes on Insects pollinating Onions.**—*J. econ. Ent.* **28** no. 5 p. 837. Geneva, N.Y., October 1935.

Insects found pollinating onions in Massachusetts in the summer of 1935 are shown in a table, which indicates the time of day at which they were found and conditions of temperature, relative humidity, wind and light prevailing. Honey bees represented 31·8 per cent. of the insects caught. Next in abundance and importance were *Halictus* sp. (14·9 per cent.) and *Eristalis arbustorum*, L. (8·4 per cent.). Although the total number of Diptera taken exceeded the total of any other Order, most of them do not seem to be structurally fitted for carrying pollen.

MENOZZI (C.). **Nota preliminare dei rapporti fra insetti dannosi alla bietola da zucchero e altre piante.** [A preliminary Note on the Relation between Insect Pests of Sugar-beet and Plants other than Beet.]—*4 Congr. int. tec. chim. Industr. agric.* reprint 7 pp. Brussels, 1935.

This is a general discussion of the alternative food-plants of the principal beet pests in Italy and of the insects that are alternative hosts of the parasites that attack them. Most of the information has already been noticed [*R.A.E.*, A **18** 561 ; **19** 461 ; **20** 252 ; **21** 267 ; **22** 201], the pests in order of importance being *Conorrhynchus mendicus*, Gyll., *Cassida vittata*, Vill., *C. nobilis*, L., *Lixus junci*, Boh., and *Chaetocnema tibialis*, Ill.

Blumberg (B.). **The Life Cycle and Seasonal History of** *Ceroplastes rubens*.—*Proc. roy. Soc. Qd* **46** pp. 18–32, 1 pl., 6 figs., 12 refs. Brisbane, 20th May 1935. [Recd. November 1935.]

In Queensland *Ceroplastes rubens*, Mask., is a serious pest of *Citrus* and attacks a variety of other plants. Observations were made on scales on trees in the open and also on potted seedlings in an insectarium. Crawlers were transferred from *Schinus terebinthifolius* to several kinds of seedlings, but only on those of this species did they complete development.

On hatching, the larvae migrate from beneath the parent scale and settle on leaves or stems, generally over veins. Development is gradual, and, including the adult stage, there are 4 instars, which are described ; the ecdyses occur abou t3, 6 and 10–11 weeks after settling. Clusters of ovarioles in the young adults develop into yolk, and the embryos appear after a period varying from perhaps 3 months for the winter-spring generation to perhaps 1 month for the spring-summer generation. Propagation is probably parthenogenetic ; very rarely, small scales, possibly males, were found, but these were all dead. From 650 to 700 eggs were found in gravid females and as many as 250 larvae, most of them dead, beneath a single scale. The eggs hatch in 2–3 days. The whole life-cycle occupies 4–6 months in the summer and 6–8 months in the winter. On umbrella trees (*Brassaia actinophylla*), lemon and mango, there are two laying periods, from late January to May or June, and from late September to November or December. During these periods larvae emerge in bursts, depending probably on environmental conditions.

Newly hatched larvae lived only 4–5 days without food, but adult scales laid eggs after 40–46 days starvation. Of 300 marked scales on an umbrella tree 62 per cent. of those less than a month old disappeared in 3 weeks, and for some individual leaves 79 per cent. of the scales were dead or missing. The greatest disappearance occurred amongst the earlier stages. Predators included *Cryptolaemus montrouzieri*, Muls., which ate only the crawlers ; *Leis conformis*, Boisd., which ate eggs and crawlers ; and the larvae of the Noctuid, *Catoblemma dubia*, Butl. The wax-glands are described.

da Costa Lima (A.). **Insetos do Brasil.** [Insects of Brazil.]—*Campo* **6** no. 8 pp. 20–24 ; no. 9 pp. 20–27 ; no. 10 pp. 11–16 ; 14 figs., 165 refs. Rio de Janeiro, August–October 1935.

The first two parts of this paper, which is to be continued, deal generally with the classification of insects, and the third contains a brief account of the orders Thysanura and Collembola, including keys to the families and brief mention of some of the species that occur in Brazil.

Edwards (W. H.). **Pests of the Tomato.**—*J. Jamaica agric. Soc.* **37** no. 12 pp. 629–639, 9 figs. Kingston, Jamaica, December 1933. **Insect Pests of the Tomato.**—*Op. cit.* **38** no. 3 pp. 135–137 ; **39** no. 9 pp. 565–568, 3 figs. March 1934 & September 1935.

Popular notes are given on the bionomics and control of the more common pests of tomato in Jamaica. The insects dealt with comprise :

ants, which carry off the germinating seeds [*cf. R.A.E.*, A **21** 356]; cutworms, which destroy the seedlings and of which *Prodenia ornithogalli*, Gn., *Xylomyges sunia*, Gn., and *Lycophotia infecta*, Ocks., are the most injurious; flea-beetles and the Sphingid, *Protoparce sexta jamaicensis*, Butl., which feed on the leaves; and *Heliothis obsoleta*, F., which attacks the fruit.

MUNCIE (J. H.). **Yellow Dwarf Disease of Potatoes.**—*Spec. Bull. Michigan agric. Exp. Sta.* no. 260, 18 pp., 7 figs., 8 refs. East Lansing, Mich., August 1935.

An intensive study of the cause and means of dissemination of yellow dwarf of potato has been carried out in Michigan, where the disease has recently become generally distributed and in certain local areas an important limiting factor in potato production. It was first reported from New York in 1917, and it has since been found in several other States. It causes decreased yields and loss of quality. The symptoms, which are described, are more pronounced and severe at high temperatures. A number of experiments to determine the nature of the causal agent indicated that it was not carried in the soil, and inoculation tests showed that it is a virus transmitted by means of tuber grafts and by *Empoasca fabae*, Harr. (potato leafhopper) and *Macrosiphum solanifolii*, Ashm. (potato Aphid), the former being the better carrier. The symptoms were slight or absent in the plants to which these insects transmitted the disease, but were more marked in the first vegetative generation from them and were pronounced in the second. K. Koch obtained experimental transmission by *Myzus persicae*, Sulz. [*R.A.E.*, A **23** 1], but L. M. Black was unable to do so by this Aphid, *M. pseudosolani*, Theo., or *Macrosiphum solanifolii*. In his experiments, however, examples of *Aceratagallia* (*Agallia*) *sanguinolenta*, Prov., collected from infected potato fields and caged on healthy potato plants transmitted the disease, although symptoms did not develop during the current season but on plants of the second vegetative generation. Leafhoppers of this species were also collected in April from grass lands at the edges of fields showing yellow dwarf in the potato crop of the preceding season, and when they were caged on healthy plants in the greenhouse, symptoms of the disease appeared in 39 days. It therefore appears that the virus overwinters either in the adults of *A. sanguinolenta* or in some host other than potato. As this Jassid has been found abundantly in Michigan on potato, clover and lucerne, the fact that lucerne is frequently grown there in proximity to potato may explain the recent rapid spread of yellow dwarf. Attempts to transmit the virus by needle inoculation or hypodermic injection of infected plant juice gave negative or doubtful results. Control measures recommended include the use of seed free from yellow dwarf, thorough roguing throughout the growing season, and spraying with Bordeaux mixture (8 : 12 : 100) to control the insect vectors of the disease. Spraying should be started when the plants are 4–6 inches high and continued throughout the season at 10–14 day intervals, keeping the new growth adequately covered. All infected plants should be removed from the field and buried or burned immediately. They should be carried from the field in bags or pails to prevent Aphids from dropping on healthy plants.

DEAN (R. W.). **The Anatomy and Postpupal Development of the Female Reproductive System in the Apple Maggot Fly** *Rhagoletis pomonella* **Walsh.**—*Tech. Bull. N. Y. St. agric. Exp. Sta.* no. 229, 31 pp., 28 figs., 20 refs. Geneva, N.Y., July 1935. [Recd. November 1935.]

The anatomy and postpupal development of the female reproductive system in *Rhagoletis pomonella*, Walsh (apple maggot fly), are described in detail. By morphological study an average and minimum of 9–10 and 7–8 days were determined for the preoviposition period in eastern New York [*R.A.E.*, A **23** 476], which is important for control because the eggs are laid within the apple in positions inaccessible to sprays.

BARBER (H. S.). **The Tobacco and Solanum Weevils of the Genus** *Trichobaris.*—*Misc. Publ. U.S. Dep. Agric.* no. 226, 28 pp., 1 pl., 1 map, 2 figs., 15 refs. Washington, D.C., September 1935.

This revision of the 12 species of *Trichobaris* (of which 3 are described as new) is the outcome of attempts to supply identifications of the weevils of this genus submitted as injurious to tobacco, potato and other cultivated solanaceous plants in the United States. Such injury is supposed to follow temporary migration of a local species from some wild solanaceous food-plant to an adjacent cultivated plant. The paper includes records of the distribution and food-plants of the various species, notes on their synonymy, varieties and distribution, a discussion of their specific characters and male genitalia, and a key. Two species that are commonly stem-borers in *Datura* also attack tobacco stems, *T. mucorea*, Lec., in the United States and Mexico, and *T. championi*, sp. n. (which also infests tomato stalks) in Mexico. *T. trinotata*, Say, long known to attack potato in the eastern States, also attacks egg-plant and normally breeds in the stems of *Physalis* and *Solanum carolinense*. In contrast to the stem-boring forms, some species breed in the seed-capsules of *Datura*, but incomplete data on specimens suggest that they may attack cultivated plants, including potato.

HERRICK (G. W.). **Insect Enemies of Shade-trees.**—Demy 8vo, viii + 417 pp., frontis., 321 figs., many refs. Ithaca, N. Y., Comstock Pubg. Co., Inc., 1935. Price $5.00.

This book discusses primarily the problem of the preservation of shade-trees from insect pests in the United States, but treats also the related question of the comparative utility of different trees from their aesthetic value, hardihood, adaptability, and immunity from injury and disease. The three introductory chapters deal with the value of shade-trees and general methods of protection from insect attacks, materials and apparatus for the control of shade-tree insects, and suggestions for the treatment of weakened trees. The subsequent chapters deal with all the important shade-trees (including ornamental shrubs) and under each species or group of species a concise account is given of its insect enemies, including descriptions of various stages, notes on distribution, life-history, nature of damage, and methods of control, and a few references to important papers. All the more injurious insect pests of shade-trees east of the Rocky Mountains and most of those on the Pacific coast are dealt with. A general index and one giving the popular and scientific names of the trees and shrubs mentioned in the text are appended.

BROWNE (F. G.). **Borer attack on Logs on Meranti Tembaga.**—*Malay. Forester* **4** no. 4 pp. 182–186. Kuala Lumpur, October 1935.

An experiment was carried out in Malaya to determine the effect of barking and exposure to sunlight on the infestation of logs of *Shorea leprosula* by different species of ambrosia beetles. Each of four pairs of logs consisted of one barked and one unbarked log. Two pairs were in the shade, and two pairs in the sun. One pair in each situation was given a quarter turn daily to expose all sides in turn. The logs were visited weekly for 7 weeks and the number of entrance galleries counted.

Only 3 species were present in sufficient numbers to give conclusive results. *Diapus* sp. appeared while the logs were being cut, increased rapidly for 2 weeks, then gradually until the sixth week, and rapidly again in the seventh week, probably owing to the emergence of a new generation. A few galleries of *Platypus cupulatus*, Chap., were found at the end of the first week and their numbers increased slowly up to the fourth week, after which increase was rapid but irregular. *Platypus* sp. was numerous between the first and second weeks and then increased slowly but steadily. The gradual increase in these cases may be due to the desertion of unsuitable galleries and construction of fresh ones.

The removal of bark could definitely be correlated with heavy attack by each of the species. The barking of logs of *S. leprosula* is therefore inadvisable, as these ambrosia beetles are their chief pests, but as the retention of bark exposes logs to attack by Longicorns, such trees as *Balanocarpus heimii*, which appears to be particularly subject to infestation by *Hoplocerambyx spinicornis*, Newm., should be barked if the logs are to remain long in the forest. Separate counts of galleries in the upper and lower halves of the logs showed even distribution except in the case of logs left in the sun and not turned, in which the galleries were practically confined to the lower side, thus indicating that the beetles avoid high sun temperatures. An examination of the barked and turned logs showed that in the one left in the shade borers were active and their galleries had penetrated well into the heartwood, whereas in the exposed log borers were active only in the side underneath at the moment, no galleries penetrated the heartwood and most of them had been deserted at an early stage.

HUTSON (J C.). **The Painted Bagrada Bug** (*Bagrada picta*).—*Trop. Agriculturist* **85** no. 3 pp. 191–193, 1 pl. Peradeniya, September 1935.

In Ceylon the Pentatomid, *Bagrada picta*, L., damages cultivated crucifers, causing young plants to wilt and die, spoiling the heads of cabbage and cauliflower and reducing the seed crop of mustard. There is no evidence as to wild food-plants. In observations on 9 pairs at Peradeniya the females lived 20–77 days and the males 44–96. Mating occurred frequently. The preoviposition period was generally about a week, though in one case it lasted 21 days. The females laid 92–217 eggs, usually singly and a few every day. In the field the eggs are scattered on leaves, leaf stalks and stems. They hatched in 5–8½ days (average 6). The young bugs completed their 5 instars in 3–3½ weeks. With a plentiful food-supply and favourable conditions, the bug increases extremely rapidly [*cf. R.A.E.*, A **19** 651] and the generations overlap.

Measures for control should be applied as soon as the bugs appear. Those recommended are a spray of 1 lb. soap in 6 gals. water against the eggs and young bugs, and hand collection of all stages, a net being used to catch the adults.

Rau (S. Ananda). **Report of the Entomologist.**—*Rep. Tea Dep. U.P.A.S.I.* 1933–34 pp. 15–22. Madras, 1934. [Recd. November 1935.]

In 1933 an investigation on *Helopeltis* infesting tea in south India was begun in Travancore, where *H. theivora*, Waterh., which causes much damage in north-east India, is the dominant species, *H. antonii*, Sign., being very rare. The oviposition habits of *H. theivora* are briefly described, and the factors affecting the intensity of the infestation discussed. Development is appreciably slower than in north-east India. In July the incubation period lasted 13 days and the nymphal period 22–23 ; in north-east India the corresponding figures were 6 and 9. The rate of development from egg to adult in north-east India is rapid during July–September but decreases considerably with lower temperatures in October. In south India development is uniform during the entire period of infestation.

In some cases 10 per cent. of the nymphs and adults of *H. theivora* were parasitised by the Mermithid, *Agamermis paradecaudata*, Steiner. Infested females are incapable of producing eggs. An unidentified larva was obtained from a few *Helopeltis* nymphs. The introduction of the Braconid, *Euphorus helopeltidis*, Ferr., from Java, where the larvae parasitise *H. antonii*, giving a percentage control of from 50–90, is under consideration.

In serious outbreaks the bushes should be only lightly pruned during November–February when the numbers of *Helopeltis* are small. All stages were found on 11 other food-plants, many of which produce fresh tender leaves during the dry weather when tea leaves are not available. Other pests observed during the year included *Dasychira horsfieldi*, Saund., the larvae of which were reported feeding on tea in November.

Rau (S. Ananda). **Report of the Entomologist.**—*Rep. Tea Dep. U.P.A.S.I.* 1934–35 pp. 10–25. Madras, 1935.

Investigations on *Helopeltis* [*theivora*, Waterh.] infesting tea in Travancore [see preceding paper] were continued up to August 1935. It does not entirely disappear from tea at any time of the year. It causes least damage in February and March, owing to high temperatures, but with a few showers of rain in April it becomes very active again. It also occurs on weeds and other jungle plants near tea, but could not be found in the jungle further away. The Javan parasite [*Euphorus helopeltidis*, Ferr.] does not appear to be suitable for introduction.

Brief notes are given on the appearance, and bionomics when known, of the following 10 species of nettle grubs found on tea during the year. *Thosea cervina*, Moore, is one of the commonest species. *T. sinensis*, Wlk., which was observed in June, is less common and lays its eggs singly or sometimes in pairs at the margins of the lower surface of the leaves. The larvae feed on the lower surfaces. Another species of *Thosea* was noted once in association with *T. sinensis*. *Natada nararia*, Moore, which occurs on coffee and *Pithecolobium dulce*, is recorded for the first time on tea. In Ceylon [*cf. R.A.E.*, A **20** 496], it is the most destructive species. The eggs are laid singly on the upper surface of mature leaves and hatch in 6–7 days. After about 5 weeks the larvae pupate, forming cocoons either on the lower branches and round the collar of the bush or under stones, in crevices, or among dead leaves beneath the bush. The moths emerge in about 18 days. *Narosa conspersa*, Wlk., has been observed on tea in south India only since 1932. The incubation period lasts 6–7 days and the life-cycle about 10 weeks. The length of the larval stage has not been studied, but in Ceylon it varies from 33 to 41 days and there are 5 moults. In south India the pupal period occupies 21–30 days. All stages were found throughout the year except in 1 or 2 months for which records are not available. Pairing takes place at night, and in one instance 138 eggs were laid in one night. The moths lived a maximum of 12 days. Parasites of *Narosa* include *Exorista heterusiae*, Coq., and another Tachinid, which attack the pupae, and an Ichneumonid that destroys the very young larvae. *Spatulifimbria castaneiceps*, Hmps., is now common on tea in south India though not generally a serious pest. In Ceylon it is usually associated with *Natada*, but in south India it occurs independently, and when associated with *Natada* invariably supersedes it. Eggs are generally laid on the upper surfaces of the leaves and hatch in about a week. The larvae mature in about 5½–8 weeks and construct cocoons from which moths emerge in about 18 days. Pairing may take place almost immediately after emergence. Oviposition may begin the next night and continues for 3 or 4 nights. In the insectary the moths lived for an average of 6 days and a maximum of 11. *S. grisea*, Hering, which was described recently [*Stylops* **4** p. 85], is recorded from central Travancore, where an outbreak occurred in 1934. *S. castaneiceps* was also present but was far out-numbered by *S. grisea*. All the stages are briefly described. In the laboratory the eggs are laid singly on both surfaces of the leaves, but were only found on the lower surface in the field. The larvae hatched in 7–9 days, and over 70 per cent. pupated in the 7th week after hatching. The larval period of the males lasted 38–46 days (average 43) and that of females 43–56 (47). The pupal period lasted 16–21 days. The moths invariably emerged between 5 p.m. and 8 a.m. Oviposition takes place after dusk and may continue for 2–10 nights. The number of eggs laid varies considerably, the average for 9 females being 205, with a minimum of 17 and a maximum of 378. The males lived for 3–8½ days and the females 3–10½. The sexes were about equal in numbers. The larvae are parasitised by a Braconid, an Ichneumonid and a worm similar to *Agamermis paradecaudata*, Steiner, and the pupae by a Braconid and a Tachinid. In one season the pupal parasites destroyed 8 per cent. In 1933 and 1934 larvae, probably of *Parasa lepida*, Cram., which is very uncommon in south India, were found on tea but moths failed to emerge. A few larvae of *Scopelodes venosa*, Wlk., were noticed during an outbreak of *Thosea cervina*. The eggs of *Belippa* (*Cheromettia*) *lohor*, Moore, which is of common occurrence but never very injurious, are probably laid in early May. The larvae moult every 8–10 days, but the number of instars is unknown. Many of the larvae died after the third or fourth moult, probably of some disease. The number of moults is believed to be more than 5, and the larval period lasts 2 or 3 months. The cocoons are similar to those of *T. cervina* but are found on the bush between the leaves instead of in the soil. A Braconid, *Batotheca leucomelaena*, Westw., parasitises the larvae, and a Tachinid was recovered from most of the pupae kept under observation. Another Limacodid, *Contheyla rotunda*, Hmps., which was recorded on tea in Wynaad in 1917 [**5** 520], has not been observed since.

Damage to tea by Tortricids was almost negligible owing to exceptionally dry weather. *Cydia* (*Laspeyresia*) *leucostoma*, Meyr., which was recorded on tea in 1933, is widely distributed in south India. Its two parasites, *Asympiesiella india*, Gir., and *Elasmus homonae*, Ferr., are much more active at certain seasons than at others. *Homona coffearia*, Nietn., was little in evidence during the year. Six unnamed Tortricids were reared from larvae collected on tea.

Cocoons of *Gracilaria theivora*, Wlsm., which were plentiful on the leaves of tea in June, were parasitised by *A. india*, and by a solitary and a gregarious Braconid. Thrips, which were particularly abundant, probably because of the dry conditions, included *Heliothrips haemorrhoidalis*, Bch., and a species tentatively identified as *Thrips tabaci*, Lind., which damages the young leaves and the flush. *Oscinis theae*, Big., was particularly numerous in May and June, mining into comparatively young as well as mature leaves. Over 81 per cent. of 60 pupae were parasitised by 4 different Braconids and Chalcidoids. Infestation by *Ceroplastes* sp. in one locality and by *Saissetia coffeae*, Wlk. (*Lecanium hemisphaericum*, Targ.) in another was severe. In the latter case the bushes had ceased to flush and many of the leaves had dropped. Both species were parasitised to a fairly large extent by Chalcidoids. In severe outbreaks the bushes should be burned or the affected branches brushed with kerosene emulsion or a solution of fish-oil resin soap. Where a large area is infested, spraying with the soap is advised. An outbreak of the Rutelid, *Anomala gemmula*, Arr., was reported over about 50 acres in one locality. The adults settled in large numbers on bushes in plucking and practically defoliated them. Many thousands were caught and destroyed. The following year the pest was reported from a different estate in the same district but was not so injurious. A similar beetle found on tea in central Travancore on one occasion was identified as *Mimela xanthorrhina*, Hope. Adults of another Rutelid, *Popillia lucida*, Newm., were observed feeding on the flowers of tea. A list is given of 16 other insects that were collected on tea, some of which occur persistently but do not appear to cause any visible damage.

Of the pests of shade trees, the most injurious on *Albizzia* in south India are the Pierids, *Terias hecabe*, L., and *T. blanda*, Boisd. The best method of control is to collect and destroy the pupae, which are found on the branches and leaf-stalks. Young plants can be sprayed with 1 lb. soap in 6 gals. water. A Hymenopterous parasite attacks the larvae. An unidentified looper was reported on *Albizzia* in one locality. *Grevillea* is damaged by *Zeuzera coffeae*, Nietn., the larvae of which tunnel into the branches, *Tetranychus bioculatus*, W.-M., an unidentified looper that attacks the leaves, and a Membracid that feeds on the stalks. The leaves of the red gum [*Eucalyptus* *rostrata*] are attacked by a leaf-tier and a Tetranychid mite, and the stem by a borer larva. *Helopeltis antonii*, Sign., damages the young plants in one locality, and termites are alleged to attack the roots. *Belippa lohor* is common on red gum in central Travancore, and *Stephanoderes* (*Hypothenemus*) *plumeriae*, Noerdl., and *Xyleborus* spp. have been found boring in the twigs.

HIROSE (K.). **On** *Anadastus filiformis* **Fabr., a new Pest of Italian Millet. (Preliminary Note.)** [*In Japanese.*]—*Insect World* **39** no. 11 pp. 403–405, 1 pl. Gifu, November 1935.

Near Gifu the larvae of the Languriid, *Anadastus filiformis*, F., are found in the stalks of Italian millet [*Setaria italica*] from late August onwards, sometimes attacking 30 per cent. of the stalks in a field. They pupate in the stalks, and the beetles usually emerge during the night. There appears to be one generation a year.

KOBAYASHI (G.). *Prontaspis yanonensis* **Kuw.** [*In Japanese.*]—*Insect World* **39** no. 11 pp. 406–408. Gifu, November 1935.

A popular account is given of the bionomics and control of *Prontaspis yanonensis*, Kuw., which is very injurious to *Citrus* in Wakayama Prefecture, where it was first discovered in 1925. It has three generations a year, the larvae usually emerging towards the end of May, July and September. The oviposition period lasts 40 days.

YAGO (M.). **On** *Crocidophora evenoralis* **Wlk., a new Pest of Bamboo.** [*In Japanese.*]—*J. Plant Prot.* **22** no. 9 pp. 44–46, 1 pl. Tokyo, September 1935.

Descriptions are given of all stages of the Pyralid, *Crocidophora evenoralis*, Wlk., which occurs on bamboo in Japan. The larvae spin together as many as 10 leaves and feed on them.

MIZUSAWA (H.) & FUJITA (K.). **Fundamental Studies concerning the Control of** *Ceroplastes rubens* **Mask., 1.** [*In Japanese.*]—*J. Plant Prot.* **22** no. 11 pp. 840–847. Tokyo, November 1935.

Ceroplastes rubens, Mask., a pest of *Citrus*, was first noticed in 1922 in Kanagawa Prefecture, and since then has spread over this area. When the branches are cut off before the middle of April, the adults die before the eggs are laid. Resin wash kills 100 per cent. of the larvae 5 weeks or less after they hatch and 93·5 per cent. 5 weeks later. Oil emulsion is less effective.

HITOMI (T.). **On** *Archips breviplicanus* **Walsingh.** [*In Japanese.*]—*J. Plant Prot.* **22** no. 11 pp. 856–860. Tokyo, November 1935.

Tortrix (*Archips*) *breviplicana*, Wals., is very injurious to pear in Tottori Prefecture, and appears to have at least three generations a year. The larvae feed on the leaf buds in early spring and later spin two leaves together. Those of the subsequent generations attack the leaves and the surface of the fruits. Sometimes 30–40 per cent. of the fruits are injured. Collecting the moths with molasses baits, and spraying with lead arsenate are recommended.

SASAKI (I.). **On three new Species of** *Aspidiotus* **and** *Chrysomphalus* **discovered in Plant Inspection.** [*In Japanese.*]—*J. Plant Prot.* **22** no. 11 pp. 864–867, 1 pl. Tokyo, November 1935.

The new species described are *Aspidiotus aspleniae* from Manila, *A. euphorbiae* from South Africa and *Chrysomphalus saipanensis* on palm from Saipan (Ladrone Islands).

HARUKAWA (C.). **Causes of the Fluctuation of Emergence of the Moths of** *Chilo simplex*, **Butl. from the hibernating Stage.** [*In Japanese.*]—*Dobuts. Zasshi* **47** no. 562–563 pp. 489–500. Tokyo, September 1935.

The rice-borer, *Chilo simplex*, Butl., hibernates as a mature larva, and near Kurashiki the moths emerge from May to July. Emergence is affected to some extent by temperature and moisture, but the long period taken cannot be explained by these factors [*cf. R.A.E.*, A **23** 721]. It is therefore concluded that the fluctuation must be caused by individual variability in the insects themselves.

ESAKI (T.). **New Name for** *Dikraneura dorsalis*, **Esaki, 1931.**—*Mushi* **8** no. 1 p. 24, 4 refs. Fukuoka, September 1935.

Dikraneura fragi, n. n., is proposed for *D. dorsalis*, Esaki nec DeLong. This Jassid is a pest of strawberry in Kyushu [*R.A.E.*, A **23** 261].

MATSUDA (M.). **Studies on** *Chrysomphalus aonidum* **L., IX.** [*In Japanese.*]—*Mushi* **8** no. 1 pp. 29–36, 4 refs. Fukuoka September 1935.

In Kyoto *Chrysomphalus ficus*, Ashm. (*aonidum*, auct.) has two generations a year and hibernates in the adult stage. The adults appear in late May and early June and again in late July and early August. The females mature in 50–87 days after hatching and the males in 25–30 days.

YUASA (H.). **Methods of Attracting** *Echinocnemus bipunctatus* **Roelofs.** [*In Japanese.*]—*Kontû* **9** no. 4 p. 204. Tokyo, October 1935.

In Tochigi Prefecture stalks of bamboo are set up round rice nurseries, and the adults of *Echinocnemus bipunctatus*, Roel. [*cf. R.A.E.*, A **17** 343] attracted to them are collected. In recent years, hemp stalks have been used instead of bamboo. Pieces of sweet potato placed in the rice nursery also attract the beetles.

TAKIZAWA (M.) & AKIYAMA (T.). **On** *Athalia rosae* **L.** [*In Japanese.*]—*Kontyû* **9** no. 5 pp. 207–220, 1 pl., 9 refs. Tokyo, October 1935.

Crucifers in Yugakujo, Manchuria, are attacked by *Athalia rosae*, L. (*colibri*, Chr.), all stages of which are described. It has 5 generations a year, overwintering as a larvae in the cocoon. The females begin to oviposit 1–3 days after emergence and lay 50–150 eggs in 4–11 days. The egg, larval and pupal stages last 4–12, 7–12 and 4–8 days. The larvae moult 4–6 times and pupate in the soil. Pyrethrum or derris is recommended for control.

Sato (T.). **An Investigation of the Food Habits of some Phytophagous Lamellicorns, 1.** [*In Japanese.*]—*Sylvia* **6** no. 3 pp. 108–128. Taihoku, July 1935.

May-beetles attacking trees near Taihoku (Formosa) include: *Anomala expansa*, Bates, feeding on persimmon, *Bischofia javanica*, the fruits of grape and *Prunus*, etc.; *A. cupripes*, Hope, on *Terminalia*, grape, *Prunus*, the leaves and flowers of *Acacia confusa*, the flowers of mango, etc.; *Adoretus hirsutus*, Ohaus, on maple, alder, etc.; *A. sinicus*, Burm., chiefly on *Terminalia*; and *Microtrichia formosana*, Moser, on *Bischofia*, *Bauhinia*, etc. The last three species are most numerous about 8, 10 and 10.30 p.m. respectively.

Takano (S.) & Ijima (K.). **Relation of breaking of Sugar-cane by the Storm to the Injury of Borers.** [*In Japanese.*]—*J. Ass. Sug. Plant. Formosa* **13** no. 5 reprint 5 pp. Taichu, May 1935.

Numbers of sugar-cane stalks were broken by a storm in the south of Formosa in December 1934. More than 92 per cent. of the stalks were found to be injured by moth borers, including over 75 per cent. attacked by *Diatraea venosata*, Wlk., and the breaks occurred at the site of injury. This was lower in stalks attacked by *Eucosma schistaceana*, Sn., than in those attacked by *D. venosata*.

Ijima (K.). **On the Spread of the Larvae of** *Eucosma schistaceana* **Snell. on the young Sugar-cane.** [*In Japanese.*]—*J. Ass. Sug. Plant. Formosa* **13** no. 6 reprint 4 pp. Taichu, June 1935.

Eucosma schistaceana, Sn., is very injurious to sugar-cane in Formosa, one female laying 200–600 eggs, not in masses. The larvae usually bore into the canes on which the eggs are laid, but some crawl to other canes or are blown to them by wind. In an experiment, a larva crawled for 20 ins. The larvae in the canes on which the eggs were laid were crowded and showed retarded development in comparison with those that had migrated.

Ijima (K.). **Relation of Oviposition of** *Eucosma schistaceana* **Snell. to the Varieties of Sugar-cane.** [*In Japanese.*]—*J. Ass. Sug. Plant. Formosa* **13** no. 9 reprint 9 pp. Taichu, September 1935.

Some varieties of sugar-cane in Formosa are more injured by moth borers, partly because more eggs are laid on them. *Eucosma schistaceana*, Sn., prefers to oviposit in shaded places on the lower surface of the leaves and avoids plants with narrow and erect leaves.

Kuriyama (S.). **An Account of the Formosan Termites attacking Buildings.** [*In Japanese.*]—*Rep. Jap. Ass. Adv. Sci.* **10** no. 3 pp. 658–662, 1 fig. Tokyo, October 1935.

Coptotermes formosanus, Shir., *Leucotermes speratus*, Klb., and *Termes* (*Odontotermes*) *formosanus*, Shir., attack the woodwork of buildings in Formosa. In breeding experiments, the first two species made their nests just under timber and the last in soil separated from it. In nature, the nests of *C. formosanus* are always in contact with timber; those of *T. formosanus* are separated from it in soil, and those of *L. speratus* are in decayed timber. In outdoor tests of the resistance of timbers, *Tsuga*, *Taiwania cryptomerioides*, *Keteleeria* *davidiana*, pine, etc., were badly injured by these termites, but *Chamaecyparis formosensis*, *Melia azedarach*, *Lithocarpus* spp. and oak were only a little attacked, and *Libocedrus macrolepis*, *Cunninghamia lanceolata*, *Nephelium* (*Euphoria*) *longana* and *Podocarpus* were scarcely attacked at all. *Chamaecyparis formosensis* and *Cunninghamia lanceolata* contain an oil that boils at or above 200°C.

TAKANO (S.). **On the Distribution, Status of Outbreaks and Control Methods of the Important Sugar-cane Insects in Formosa.** [*In Japanese.*]—*Rep. Jap. Ass. Adv. Sci.* **10** no. 3 pp. 840–845. Tokyo, October 1935.

At present over 300 insects are known to attack sugar-cane in Formosa, of which 24 that are very injurious are listed. Their distribution and abundance are affected by temperature, precipitation, soil conditions and food-plants. *Oregma* (*Ceratovacuna*) *lanigera*, Zehnt., and moth borers are more numerous in the southern than the northern part of the Island because of high temperature and less precipitation during winter in the south. *Alissonotum* spp. are not found in the north, apparently because of the large amount of rainfall in winter. *Gryllotalpa formosana* Shir., and the larvae of the Elaterid, *Lacon musculus*,Cand., are more common in sandy soils, but *Alissonotum* spp. are scarce and are more common in the lowlands. Termites are abundant in mountainous districts. *G. africana*, P. de B., is numerous in damp places, but *G. formosana*, *O. lanigera*, termites and *Alissonotum* spp. are common in dry lands. The Lygaeid, *Ischnodemus saccharivorus*, Okajima, is found in the northern half of the west coast and along the whole coast on the east. Selection of varieties and seedlings, periods of planting, clearing of fields, drainage, rotation and isolation of new cane fields from old ones have to be considered for control.

HOFFMANN (W. E.). **An abridged Catalogue of certain Scutelleroidea (Plataspidae, Scutelleridae and Pentatomidae) of China, Chosen, Indo-China and Taiwan.**—*Lingnan Univ. Sci. Bull.* no. 7, iv + 294 pp. Canton, 1935.

This systematic catalogue includes 448 species and 32 varieties of 153 genera, occurring in China, Korea, Formosa and Indo-China, of which 96 species and 12 varieties are not listed in Kirkaldy's World Catalogue (1909), most of them having been described since. It also contains a table showing the numbers of forms recorded in each catalogue, those common to both and those in the new catalogue only; a list of genera and species in which those not included in the older catalogue are marked; an annotated bibliography of 540 titles; an appendix on faunistic sub-regions and the classification under them of political areas and localities, with a table indicating the numerical distribution of the genera and species; and an index to genera and species, including synonyms.

COSTANTINO (G.). **Un nemico del Cotonello degli Agrumi : il** *Cryptolaemus montrouzieri* **Muls.** [*C. montrouzieri*, an Enemy of *Pseudococcus citri*, Risso.]—*Boll. Staz. Frutt. Agrum. Acireale* N.S. no. 6, 7 pp., 1 fig. Acireale, October 1935.

Cryptolaemus montrouzieri, Muls., has been imported into Sicily from Spain against *Pseudococcus citri*, Risso, which is a serious pest of *Citrus*. This Coccinellid was introduced into Central Italy and Sicily in 1908, but failed to establish itself. In 1920, however, it was established in Liguria, but it is not very effective there. In the author's opinion the chief adverse factor is attacks by native ants, such as *Tapinoma erraticum nigerrimum*, Nyl., that foster the Coccid or, in Liguria, by the exotic Argentine ant [*Iridomyrmex humilis*, Mayr]. When *C. montrouzieri* has been liberated in spring, the ants should be prevented from ascending the trunks by rubbing magnesia or powdered talc in a band about 4 inches wide. In autumn shelter bands for the beetles to hibernate in should be fixed on the trunk and branches.

KOZHANTSCHIKOV (I.) & MASLOWA (E.). **Zur Frage nach dem Temperaturoptimum des Lebens. iv. Ueber die Totalmenge des verbrauchten Sauerstoffs während der Puppenmetamorphose.** [The Question of the Vital Optimum Temperature. iv. The Total Amount of Oxygen used during Pupal Metamorphosis.]—*Zool. Jb.*, Allg. Zool. **55** no. 2 pp. 219–230, 15 refs. Jena, 28th October 1935.

In these experiments larvae of *Loxostege sticticalis*, L., were reared at 25–26°C. [77–78·8°F.], *Chenopodium album* being used as food. The resultant female pupae were exposed to different temperatures and the adults paired with males bred at 25°C. The speed of development of the female pupae was greatest (7·5 days) at an average of 33·3°C. [91·94°F.]. The lowest mortality (7 per cent.) was at 28·1°C. [82·58°F.] and when the pupae had been kept at this temperature the life of the female adults was longest, averaging 17·9 days, and the number of eggs laid per female was largest, averaging 299. The total amount of oxygen consumed during pupal development was lowest at 24·4°C. [75·92°F.].

A decrease of temperature reduced the speed of development more than the consumption of oxygen, and a rise in temperature increased the consumption of oxygen more than the speed of development, so that both changes resulted in a greater total consumption of oxygen [*cf. R.A.E.*, A **22** 663]. Similar results were obtained with *Euxoa* (*Agrotis*) *segetum*, Schiff., and *Ephestia kühniella*, Zell.

SCHMIDT (G.). **Beiträge zur Biologie der Aphodiinae (Coleoptera, Scarabaeidae).** [Contributions to the Biology of the Aphodiid Beetles.]—*Stettin. ent. Ztg.* **96** no. 2 pp. 293–350, 3 figs., 121 refs. Stettin, 20th November 1935.

This is a summary of the literature on Aphodiid beetles, supplemented by records of original biological observations, especially of German species.

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BARANOV (N.). **Neue paläarktische und orientalische Raupenfliegen (Dipt., Tachinidae).** [New Palearctic and Oriental Tachinids (Descriptions of 3 new genera and 18 new species, chiefly from the Japanese Empire).]—*Vet. Arhiv* **5** pt. 12 pp. 550–560. Zagreb, 1935.

MIWA (Y.) & SONAN (J.). **Description of a new egg parasite** [*Aprostocetus fukutai*, sp. n.] **of** *Melanauster chinensis* **Forst. from Formosa.** [*In Japanese.*]—*Trans. nat. Hist. Soc. Formosa* **25** no. 146 pp. 406–407, 1 pl. Taihoku, November 1935.

OSHIMA (K.). **On the Susceptibility of** *Chilo simplex* **Butl. to** *Nosema bombycis* **and its Effect on the Haemolymph Cell.** [*In Japanese.*] —*Dobuts. Zasshi* **47** no. 562–563 pp. 607–626, 3 pls. Tokyo, September 1935.

MURATA (T.). **Historical Accounts of the Studies on** *Chilo simplex* **Butl. during the Period of Meiji (1868–1926) and the Development of Control Methods in Japan.** [*In Japanese.*]—*Kontyû* **9** no. 4 pp. 181–203, 1 pl., 14 figs. Tokyo, October 1935.

YUASA (H.). *Xyleborus apicalis* **Blandf. infesting Chestnut Trees.** [*In Japanese.*]—*Kontyû* **9** no. 4 p. 204. Tokyo, October 1935.

SHINJI (O.). **Key to Japanese Species of** *Myzus*, **with Description of a new Species** [*geranicola*, sp. n.]. [*In Japanese.*]—*Kontyû* **9** no. 5 pp. 233–238, 1 fig. Tokyo, October 1935.

SHINJI (O.). **Key to Japanese Species of** *Macrosiphum*, **with Description of a new Species** [*naazamii*, sp. n.]. [*In Japanese.*]—*Kontyû* **9** no. 5 pp. 239–243, 1 fig. Tokyo, October 1935.

SHINJI (O.). **On** *Macrosiphum rosae* **L. and** *M. rosae ibarae* **Mats.** [*In Japanese.*]—*Kontyû* **9** no. 5 pp. 244–248. Tokyo, October 1935.

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DA COSTA LIMA (A.). **Um novo "frade," praga do arroz, no Rio Grande do Sul. (Hemiptera: Pentatomoidea.)** [A new Pentatomid (*Ogmocoris reinigeri*, sp. n.) attacking Grains of Rice in Rio Grande do Sul, Brazil.]—*Campo* **6** no. 10 p. 16, 1 fig. Rio de Janeiro, October 1935.

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